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NEW ICE CUTTING MACHINE.

The enormous and very general consumption of ice for manufacturing and domestic purposes has made ice harvesting one of our great industries. Important as the ice crop is, it is extremely precarious, being controlled not only by the variable forces of nature, but also by a great army of men, who cut, gather, and store the ice for distribution and use. The ice harvesters, like men employed in many other kinds of business, are liable to disaffection, and it has at times occurred that the best ice of the season has been wasted in consequence of the want of a force of men necessary to secure it.

In view of the great amount of labor required in harvesting ice, and in view of the necessity for accomplishing it at the most favorable time, Mr. Chauncy A. Sager, of Valparaiso, Ind., has devised a very ingenious and effective steam ice cutter, which makes a longitudinal cut while the machine is advancing, and at the same time making transverse cuts, thus forming cakes of suitable size for handling.

The machine propels itself forward slowly, the engine at the same time driving the saws. The saw making the longitudinal cut is suspended on a long arm pivoted to the rear end of the machine on the axial line of the driving shaft, and extending some little distance rearward, and is driven by a cord or belt from the sheave on the driving shaft.

At the side of the main frame of the machine there is a swinging frame supported from a countershaft journaled in an overhanging frame. The swinging frame carries at its lower and free end a saw shaft, on which is secured the cross-cutting saw, and which is provided with a key way, receiving the spline of the driving pulley, the shaft being free to move endwise while the pulley remains in one position. On the end of the saw shaft is a sharp edged curved shoe, which engages the ice, and is steadied by a rod extending from the forward end of the swinging frame. Motion is communicated to the countershaft of the cross-cutting saw by means of miter gearing and a shaft running lengthwise of the main frame of the machine. On the forward end of a shaft geared to the longitudinal shaft there is a crank, which gives lateral motion to the swinging frame, and causes the saw to make the crosswise cut.

The motion of the saws is controlled by levers at the forward end of the machine. The driving wheels are provided with spikes to give them a firm hold on the ice, and the forward axle of the machine is movable on a king bolt to permit of steering.

The two saws with their supporting frames are capable of being folded over on the machine when they are not in use, or when the cutter is to be moved from one place to another.

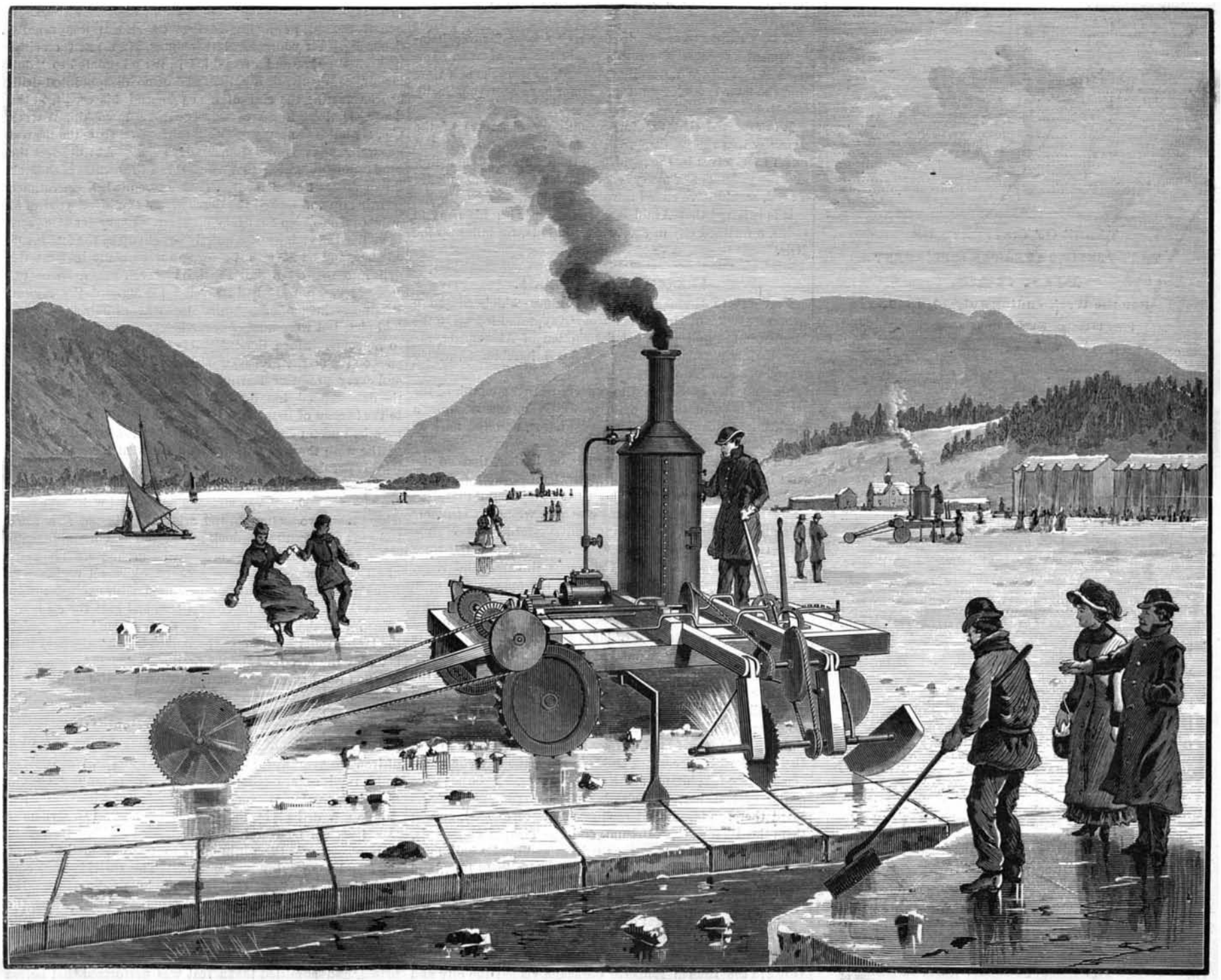
In operation the machine is propelled forward by the action of the engine, the saw at the rear is revolved, cutting the ice longitudinally, at the same time the cross-cut saw is engaged in the ice and the swinging frame receives lateral motion through its crank connection. When the cross-cut saw enters the ice the sharp edged shoe engages the ice and prevents the cross-cutting saw raft from end motion while the saw makes its cut. While this is being done, the machine gradually moves forward, causing the saw at the same time to make the longitudinal cut which separates the ice into blocks as the transverse cuts are passed. When the cross-cutting saw has completed its excursion it has also compressed a spring which carries the shaft and saw back to the point of starting as the saw is released from the ice either by running out or by being raised by cams provided for that purpose. The cross-cutting saw is now ready for another cut, and the operation just described is repeated.

For gauging the distance between the longitudinal cuts in the ice and for facilitating the making of parallel cuts, the machine is provided with a graduating gauge which extends downward from the under surface of the main frame.

This machine is capable of very rapid operation, and will doubtless be appreciated by ice harvesters and dealers who know the value of time in ice harvesting seasons.

Further information in regard to this useful invention may be obtained by addressing the inventor as above.

A CHANCE FOR INVENTORS.—A prize of $10,000 is offered by the French Government to any person who between July 1, 1882, and July 1, 1887, will have invented the most useful application of the Volta pile.



SAGER'S ICE CUTTING MACHINE.

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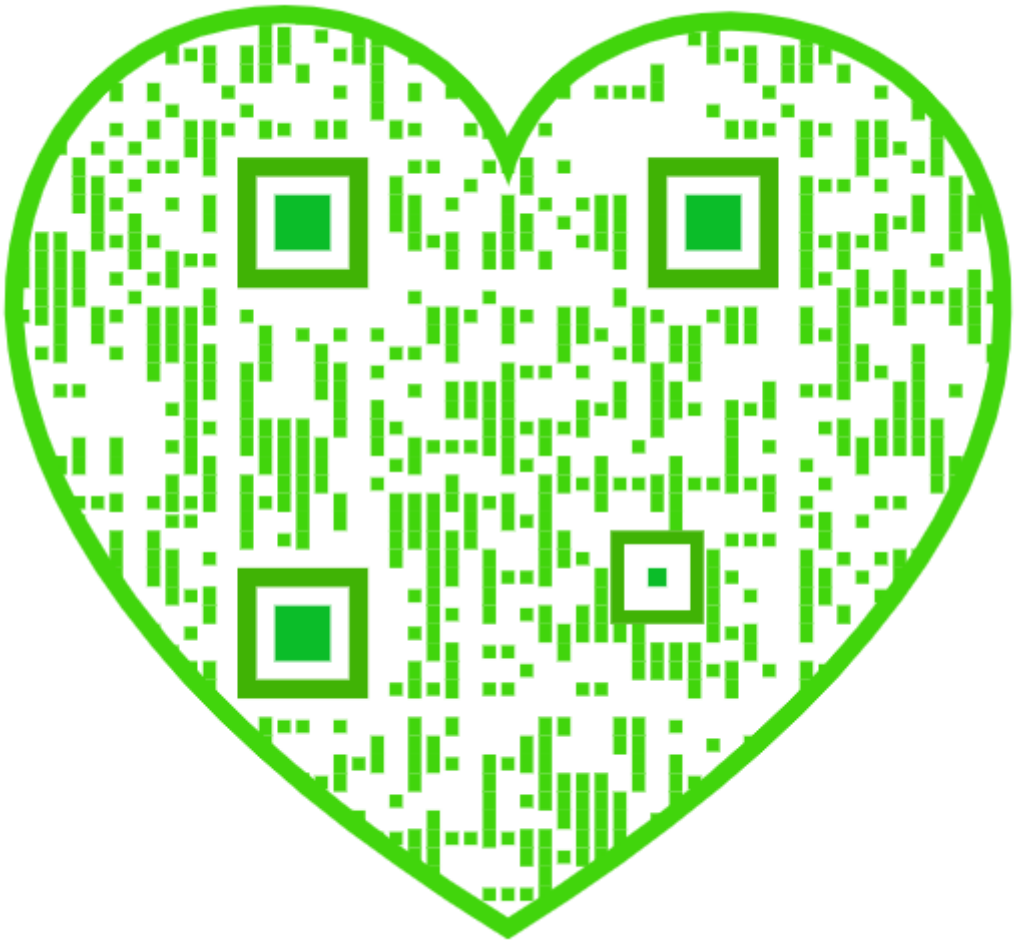

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THE BOMBARDMENT OF ALEXANDRIA.

The Egyptian revolt, under Arabi Bey, against the government of Egypt by European powers in the interest of European creditors, has ended in war. As the party chiefly interested—through the ownership of the Suez Canal and otherwise—England has assumed the responsibility of "restoring order," and has proceeded in the usual way, by bombarding Alexandria, the chief commercial city of the country. The bombardment began at 7:45 on the morning of July 11. The attacking fleet comprised seven powerful ironclads and the gun-vessels Bittern, Condor, Beacon, Decoy, and Cygnet. The strength of the ironclads is shown in the following table:

Vessel.	Inches armor.	Guns	H. P.	Tons.
Inflexible	16—24	4—81-ton	8,000	11,406
Superb	10—12	4—25-ton	7,430	8,760
Monarch	8—10	4—25-ton 2—6½-tn	7,842	8,322
Sultan	6—9	8—18-ton 4—12-ton	8,629	9,286
Alexandra	8—12	2—25-ton 10—18-ton	9,492	8,615
Téméraire	8—11	4—25-ton 4—18-ton	7,700	8,540
Invincible	6—8	10—12-ton	4,832	6,034
Penelope	5—6	10—12-ton	4,702	4,394

The defenses consisted of forts and shore batteries, mounting for the most part guns of antiquated patterns, firing round shot only, and unskillfully handled. The Egyptians showed great stubbornness, but the weight of metal was overwhelmingly on the side of the fleet. The Inflexible did good work at ranges varying from 3,000 to 5,000 yards, shelling forts right and left from her two turrets. The Monarch fired 200 heavy shells and 6,000 pounds of shot from Gatlings and Nordenfeldt machine guns.

The effect of the electric broadsides fired from the Sultan and the Alexandra was very destructive, and excellent work was done by the gunboats. In the course of the forenoon nearly all the Egyptian guns were silenced and the forts badly battered. The loss of men by the English was slight, five killed and twenty-seven wounded. The Egyptian loss was apparently heavy. None of the ships was materially damaged; few were hit at all.

The next day (July 12) the sea was too rough to allow the fleet to do much execution; and at night the city was evacuated by Arabi Bey, after it had been given over to fire and pillage. The city had been much damaged by the shells of the fleet, and the natives retaliated by burning the European quarter, with a general massacre of the remaining Christians.

It is of course too early to determine how far this bombardment has contributed to advance the art of war. Important results are naturally expected, as it is the first time that the later types of guns and armor have been practically tested.

It is reported that the foreign military observers of the fight say that the English artillerists did not greatly distinguish themselves by the rapidity or the accuracy of their fire, and the judgment of many is that lighter guns, more quickly served, would have ended the action sooner.

It is believed that Arabi Bey will retire with his army to Cairo, a fortified city of 350,000 inhabitants, 108 miles up the Nile.

THE CITY OF ALEXANDRIA.

Previous to the political disturbances which caused a general exodus of Europeans from Egypt and led up to the bombardment and practical destruction of Alexandria, the city had a population of about 215,000 inhabitants, nearly 50,000 of them Europeans.

The city lies on the Mediterranean, near the mouth of the westernmost arm of the delta of the Nile, and occupies a peninsula, anciently the island of Pharos, and the neck of land connecting it with the mainland.

On each side of the isthmus is a good harbor, that on the west being mainly artificial. Its excellent position for trade made it the chief commercial city of Egypt and the great central station for passengers east and west, the steamers to and from India, the Levant, and Western ports all stopping there. It is connected with Mansoora and the Suez Canal by railroad, and with Cairo by rail, canal, and river. In its newer portion Alexandria had the appearance of a European city. It was lighted with gas and supplied with water from the Nile. Besides its large export and import trade the city was the seat of large government and private manufactures run by steam. It had many fine residences. Among the prominent buildings were the palace of the Khedive at Ras-el-Tin, the large naval arsenal, the naval and military hospitals, the Custom House, Tribunal of Commerce, Italian College, and the various schools.

Alexandria was founded by Alexander the Great in 332 B.C Under his successors, the Ptolemies, the city contained 300,000 free inhabitants and as many slaves. It became the center of learning, and schools of Grecian philosophy flourished there. Magnificent monuments were erected, among them the Pharos, the Museum, and the Temple of Serapis, and there were many gorgeous palaces and public buildings.

Julius Cæsar besieged and took the city in 48 B.C., and eighteen years later Augustus made it an imperial city. It now began a new season of prosperity, continuing till the establishment of the seat of empire at Constantinople. The Catacombs, public baths, and Pompey's Pillar, with the Roman city wall were erected during this period. In the year 215 the Roman Emperor Caracalla visited the city and ordered a general massacre, and under the rule of Gallienus a famine swept off half of the population. In 273 an insurrection resulted in the destruction of the great library of the museum. In 296 another revolt ended in a general slaughter, and in 365 an earthquake destroyed 50,000 persons. The Persians captured the city in 616, and yielded it to the Arabs in 641. It then contained 400 palaces, 400 theaters, 4,000 public baths, and 12,000 gardens.

From this time on it rapidly decayed, and its population and trade diminished. Cairo took its place as the chief city of Egypt. It finally sank so low that in 1777 its population was only 6,000.

FIRING ALLEGED TO BE HEARD 1,000 MILES.

For the first time in history the progress of a great naval engagement has been consecutively reported by telegraph. A novel member of the fleet before Alexandria was a telegraph ship, through which, by means of the Mediterranean cable line, the War Office in London and the civilized world were kept informed of the movements of the war vessels and the results of the firing.

The nearest cable station from Alexandria was at Malta, distant about 1,000 miles from the scene of the battle. A press dispatch says that when a telephone was attached to the Malta end of the cable the firing of the guns at Alexandria could be distinctly heard, though no oral communication was possible over that length of cable. It is not stated whether a telephone transmitter was used at the Alexandria end, or whether the general electrical disturbance, caused by the explosion of the great guns, so affected the cable as to report the shots, through the telephone, at Malta.

REMARKABLE DEVELOPMENTS IN OIL.

The history of the oil trade of this country does not furnish a parallel to the effect of recent developments. The result of the penetration of a certain rock 1,600 feet below the surface, in the wilderness of Warren Co., Pa., has been to form anew the map of the oil regions, to depreciate the value of oil above ground (30,000,000 barrels) 30 cents per barrel, or a total shrinkage of $9,000,000, and to enrich a few and impoverish many. The history of well "646" would read like a romance, but the reality of its effect upon the trade is grim and matter-of-fact to the last degree. On the 1st of April last crude oil was selling at 80 cents per barrel. The producers had good grounds for encouragement in the general situation. Consumption was increasing, and one of the old producing regions (Bradford) was rapidly declining. Its young rival (Richburg, N. Y.) had reached its highest point, and everything in reason pointed to "dollar oil." Meanwhile a patient and often disappointed driller was nearing the end of his cable and his credit, in the dense hemlock forest of Cherry Grove township, Warren Co., six miles from any oil well, four miles from the nearest gas well, and two miles from a "dry hole." At 1,612 feet the sand pump brought up that which threw the owners of the well into a fever of excitement. They suspended all operations, boarded up and locked the derrick, and employed a patrol of armed men to keep out every intruder. Every available acre of land in the vicinity was quietly bought up by the few favored ones, and on May 18 the owners were ready to start the drill into the oil rock. In the interval, the fame of the "Mystery, No. 646" had traveled throughout the region. Producers in general regarded the whole affair as a deep-laid plot, but were uneasy nevertheless, and oil had dropped to 73 cents. Since the "Mystery" had exerted an influence on the market, 10,000,000 barrels had been sold "short," and every producer heartily wished "646" in Jericho. On the date named the fires were lighted and the drill started in the bottom of the well. By the time the soft pebble-filled rock had been pierced 8 feet the oil was flowing from the top of the well, through two two-inch pipes, at the rate of 1,400 barrels per day, and the entire trade was, for the time, paralyzed. To-day this well is rated at 800 barrels, and, since May 18, a 3,000, a 2,500, and a 2,000 barrel well have each added their production to the original "Mystery;" a town has grown up in the hemlock forest, and a score more drills are nearing the same long neglected storehouse. The price of oil has reached 52 cents, and the older oil regions are being depopulated to fill the new field with excited multitudes. One thousand dollars an acre and half the oil is the price for all the land on the "45 degree line" along which the larger wells have so far been developed. Garfield City is to-day the Mecca of the oil producer, and is as strange a creation itself as can be noted in the entire oil country.

Breaking Iron with Dynamite.

The application of dynamite to the breaking up of masses of iron too great to be broken by other means, was successfully tried near Chicago recently. A refractory chunk, "salamander," of twenty tons weight, was placed in a pit. A hole was drilled in the iron, and a charge of dynamite was inserted. Several bars of iron, weighing tons each, were placed over the pit in order to prevent small pieces of the metal from flying heavenward. The cartridge was connected with a battery, stationed one hundred feet from the pit, and after the spectators had found secluded places, the word was given, and in an instant the twenty tons of iron that had previously stood all kinds of hammering, was reduced to fragments. The steel men were completely surprised, and admitted that a feat was performed that before was held impossible.

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Raw Silk Culture and the Manufacture of Sewing Silk.

The subject of silk culture has ever been strangely fascinating to those who gave it attention, and the present high state of perfection in the culture and manufacture of silk has been attained through the efforts of enthusiasts during a period of more than two thousand years. More than a thousand years since raw silk was brought from the Chinese Empire to Greece and Syria, and there wrought into fabrics by manufacturers who did not know the origin of the fiber they so wrought, and notwithstanding centuries have elapsed since the mystery was solved, and many volumes have been written and published explaining and teaching sericulture, yet many people in this age, who buy and sell or handle silk fabrics daily, appear to know but little more of its source than did the Greeks and Syrians. Certainly very few outside of silk-producing countries realize the amount of labor, as well as sacrifice of insect life, represented in a single pound of this wonderful fiber, to produce which about three thousand silk worms contribute their beautiful robes, and necessarily their lives. The number of species of silk-producing insects is very large, probably more than two hundred, very few of which are of any practical value to mankind; on the contrary, that portion of the caterpillar family which unite their silken tissues to form a family tent have not only defied the ingenuity of man to unravel their handiwork, but have made his industry contribute to their support by foraging upon fruit-bearing and ornamental trees. The spider family, notwithstanding many attempts to reel their beautiful threads, still monopolize their product for purposes of locomotion and snares for unlucky insects.

Of the family "Bombycidæ" probably fifty species form cocoons, some of which feed upon a species of milk-weed, others on the castor oil plant, mango, oak, Osage orange, etc.; but only those feeding upon mulberry leaves have been profitably raised, owing to inferior quality of silk or difficulty in reeling other species of cocoons. (S. Bertézen states in his book entitled "Thoughts on the Different Kinds of Food Given to Young Silk Worms," published in London A.D. 1789, that one worm fed on black mulberry leaves is worth more than two fed on white mulberry leaves, and that in the sixteenth century the former leaf was sold in Italy and in France three times dearer than the white.) Having made silk, and illustrated its utility, more could not be expected of the lowly worm, and it remained for mankind to discover means whereby the cast-off robes of these insects might be unraveled and manufactured into fabrics fit for ladies of high degree, as well as into sewing silk and twist for all.

It is said that the art of reeling silk was known in China nearly two thousand years B.C., it having been discovered by "Siling Chi," wife of Prince "Hoangti," third Emperor of China, and that homage is still rendered to her as "Goddess of silk worms." So well did the Orientals guard the secret of silk culture that the nature of the fiber was unknown in Europe for more than a thousand years after silk fabrics had been introduced there, and as late as the Christian era some silk fabrics were worth their weight in gold; but notwithstanding a Roman emperor once refused to purchase a silk robe for his empress on account of its expense and the bad example of extravagance, the silk worm now spins for all, and whether fashion decrees that garments be made of silk or wool true economy dictates that they be joined with Corticelli silk, to supply which the Nonotuck Silk Co., of Florence, Mass., use over 100,000 feet of floor space on which the various processes of winding, doubling, spinning, reeling, dyeing, skeining, spooling, including the knitting of silk hosiery and underwear, as well as the manufacture and printing of spools are carried on, giving employment to about eight hundred hands, and requiring a weekly supply of between three and four thousand pounds of raw silk, yielding an aggregate length in finished sewing silk, twist, embroidery, and Florence knitting silk of more than 25,000 miles. The average length of fiber produced from a single cocoon is not over one-fourth of a mile, and as fully 100 fibers are required to produce sewing silk of average thickness and strength, it appears that fully 2,500,000 miles of this gossamer fiber is consumed weekly in the manufacture of Corticelli silk, to produce which more than 10,000,000 silk worms are stripped of their robes.

Surprising as these figures appear when separately considered, they seem inconsiderable when compared to the quantity of raw silk required for purposes other than the manufacture of sewing silk, to describe which volumes might be written without exhausting the subject. The manufacture of sewing silk being comparatively simple, we will briefly describe the processes necessary to its production, including those performed by the chief workers, the patient *silk worms*.

At the expiration of from twenty-five to forty days, according to circumstances and species of worm, they cease to eat and seek convenient places to commence the formation of a castle which shall protect them in the changes incident to caterpillar life. Having selected a site, the insect ejects from two small tubes near the mouth, called spinnerets, a liquid gummy substance secreted from their food, which at their volition adheres to whatever substance may be within their reach, and, being so anchored, the next movement of the body in the opposite direction draws out the filaments, which unite and form a single thread, which is again cemented to a suitable anchor, and thus by crosswise and zigzag motions continued for from three to five days, the worm is inclosed within from 300 to 500 yards of gossamer web. Thus self imprisoned the insect, if undisturbed, remains about fifteen or twenty days, undergoing nature's wonderful changes, during which it assumes the chrysalis form, then that of the moth.

Having entered upon this new life, which at most does not exceed seven days, the moth escapes from the cocoon by moistening one end, and pushing aside the fibers, thus snarling and destroying it for reeling purposes. Thus transformed these insects appear again upon the stage, not as voracious worms, but as radiant society bugs, who promptly choose partners for short but useful lives, no part of which is allotted to eating. Assuming, however, that cocoons are to be reeled into "raw silk," it is necessary to kill the insect before the cocoon is perforated; this is done by the application of a suitable amount of heat, after which the reeling may be done at a convenient season. This is done by placing from six to ten or more cocoons in a bowl of hot water, thus softening the "gum" in the fiber, after which the outside end of each thread is readily found, and they are collectively placed on a reel, operated by hand or other motive power, and rapidly drawn on to the reel, the fiber varying from 300 to 500 yards in length, and as the end of each cocoon fiber is so reached another should be added, in order to produce uniformity in thickness of thread, a requisite indispensable in first-class raw silk.

This operation is tedious and necessarily expensive, as four ounces of *well* reeled silk represents about ten hours' labor of an expert reeler. The reels used are usually 70 or more inches in circumference, and have a traverse rod to properly distribute the thread over a surface two or three inches wide. The thread being thus rapidly crossed from side to side of the skein in reeling facilitates handling and unwinding without tangling. Skeins so reeled weigh from one to several ounces, as desired, and on being removed are dried and neatly packed into "books" (bundles) weighing from five to ten pounds. In China and Japan the books are usually packed and sold in bales of 133⅓ pounds, called "picul" bales, a very small export duty being charged.

In the process of manufacture, the skeins are soaked in tepid soap-suds for several hours to soften the "gum," after which they are placed upon light swifts and wound off on to bobbins, which are then placed upon pins projecting from the bobbin-board of a doubling-frame, and from two to ten or more threads drawn off collectively on to one bobbin, which is next placed upon a rapidly revolving spinning frame spindle; the requisite amount of twist is given while the thread is being drawn from this to the take-up bobbin, which has motion imparted sufficient to give the desired twist, after which it is again doubled, two threads being used for "sewing silk" and three for "twist" or "three-cord sewing silk," and again similarly twisted, but in the opposite direction. The next operation is reeling into small skeins, for "skein silk," or large "hanks," to be dyed and wound upon spools as desired. This operation is rapidly performed on a partially automatic machine, on which an expert attendant can wind 1,000 to 1,200 spools of 100 yards each, in ten hours, the requisite number of yards being gauged by the number of courses, or layers of silk wound upon each spool. This is done with surprising accuracy at the "Corticelli" manufactory, as shown by daily tests made by a person employed for the purpose, and recorded in book form, many volumes of which have been filled. The record for 1881 shows that 13,628 tests were made of "Corticelli," 100 yard, 50 yard, and 10 yard spools of silk yielding an aggregate of 1,122 yards in excess of those stamped on the spools, an average of one-twelfth of a yard on each spool over the standard claimed. Well may the manufacturers of "Corticelli" silk point with pride to their record. "Deserve success, and you shall command it." As the subject of silk culture in the United States is now assuming its old-time importance in the estimation especially of people in the Southern States, it may be well to realize in advance the probable amount of labor and expense required to produce a given quantity of silk. Assuming that mulberry trees have been grown, and suitable buildings provided in which to rear worms, the next expense will be for silk eggs, say for one ounce (about 40,000), from three to five dollars. Each worm will require during its short life, at least four-fifths of an ounce of leaves, which must be gathered as needed, "rain or shine," dried if wet, and properly distributed over the space occupied by the worms, care being taken to keep the spaces so occupied clean, dry, and wholesome. The amount of labor thus required must vary greatly, according to the abundance of leaves and the facilities for gathering, which may partially account for the discrepancy in the estimates of writers on the subject, in reading which we are impressed with the apparent candor of the Rev. D. V. McLean, of Freehold, N. J., in a report of his experience in silk culture which was prepared for and laid before the executive committee of the "American Silk Society" at their annual meeting in Washington, D. C., December 11, 1839, wherein he states that "40,000 worms consumed 2,576 pounds of leaves, and produced 130 pounds of cocoons (126 pounds after flossing), these produced 12 pounds of reeled silk. My experiment was made to get at a fair estimate of what could be calculated an average result."

He estimated that 160,000 worms could be reared from one acre of trees, which would produce 48 pounds reeled silk, and that the labor of picking leaves and attending to the worms would not exceed the value of the labor of two females and one male twelve weeks. He says in respect to his experiment: "My deliberate opinion is that more will fall below this standard than will exceed it, and in one case where a less quantity of leaves will give the above quantity of silk, two cases will occur that will require a greater. I have read with great regret many of the calculations of the day on the subject of silk profits; some of them, I greatly fear, are made purely to subserve selfish ends, regardless of the ultimate consequences to the public."

Among the large number of people engaged experimentally in silk culture in 1839 to 1840—as then reported in "American Silk Society," vols. 1 and 2—the Messrs. Cheney, then located in New Jersey, were about the most successful, producing in 1839 from 80,000 worms in twenty-four days' feeding, 356 pounds cocoons from 3,970 pounds leaves, yielding 1 pound reeled silk from 9 pounds cocoons; the average quantity required in ten other cases reported from different localities being nearly 12 pounds or 4 pounds when dry (equal to 1 bushel by measure). The system of feeding adopted by Messrs. Cheney was that of M. C. Beauvis, with M. Darcet's process of ventilation. The amount of labor required in this case is not stated, but according to the estimate of the reverend gentleman above quoted, four and a half days' labor is ample to rear worms sufficient for 1 pound of silk, the reeling of which, *if equal to fine Italian or French silk*, would call for four days' work of an experienced reeler, thus requiring about eight and a half days' labor to produce 1 pound of silk, the value of which has not averaged over $600 for a few years past.

In the above estimate, leaves from Morus Multicaulis trees were used, which are much larger and more readily gathered than those from the white mulberry tree, the former having been known to reach the dimensions of 15½ by 14½ inches exclusive of stem. In this estimate no allowance has been made for labor in cultivating trees, interest on capital invested, or risk attending the rearing of a crop of worms. But enough has been demonstrated by the repeated experiments made in the United States since James the First sought to substitute silk culture for that of tobacco in Virginia, in A.D. 1623, by offering a bounty on every pound of cocoons raised, and by imposing fines on land owners who did not plant mulberry trees, to show that the climate is favorable for silk culture, and that the problem is simply this: Can we afford to compete with the Chinese or Japanese who are now driving the not over-fed Italians out of the trade they know so well, and necessitating their seeking the more lucrative business of Indian corn growing?

The adage, "history repeats itself," is especially suggestive in respect to the failure in all previous attempts to make silk culture profitable in the United States, from the fact that while the labor market here has advanced, the price of raw silk has receded, quality considered.

The regrets expressed by the Rev. D. V. McLean, in respect to over-estimating the profits of silk culture, seem to us strikingly appropriate to the present time, considering the misleading statements frequently published, some of which we quote from a pamphlet received lately, published in St. Louis, and entitled "A Pamphlet to Introduce and Generalize Silk Culture," wherein it is stated that "a family of two grown persons and three children can rear in about forty days 38,000 silk worms." 38,000 cocoons weigh about 200 ounces. "The average price of cocoons is about $1 per pound; when very good and heavy it is about $1.50 per pound." If these statements are correct, and we think the estimate of the labor required is correct, the 200 days' labor quoted would yield from $200 to $300. On the contrary, experienced silk raisers know that an average yield of cocoons from 38,000 worms will not exceed 125 pounds when fresh, or 42 pounds when dry, and that the amount of silk obtainable therefrom would not usually exceed 10 or 12 pounds, 85 per cent of the weight of fresh cocoons being chrysalis; and as the reeling, *if well done*, costs nearly as much as the rearing of worms, it follows that fresh cocoons at $1.00 to $1.50 per pound would not be a paying investment for reeling purposes.

In striking contrast to the picture drawn by the St. Louis author, we quote from the *American Silk Journal* of May, 1882: "In the silk reports coming from Upper Italy there are complaints that the peasantry in that part of the country are very much discouraged, since silk culture has, from all appearances, ceased to be a paying industry." "The times when they used to get between 6 and 7 lire per kilogramme for cocoons seems to have gone forever"—(6 or 7 lire depreciated currency equal to $1.00 to $1.17 for 2⅕ pounds, or about 50 cents per pound)—"and they gradually abandon this pursuit and turn their attention to other more profitable branches, like tobacco, for instance. This is particularly the case with the smaller farms hitherto devoted to raising silk worms. It is estimated that last year one-third less silk eggs were hatched in Upper Italy than in 1880. If the quantity of cocoons obtained was nevertheless large, it was merely due to the casually good yield. As this year even less eggs will be hatched a deficiency in that region is quite likely to occur."

Canadian Fisheries.

The fisheries statistics for the year 1881, just published, show the total value of the production of the fisheries of Canada to be $15,817,162; the value in the provinces for the year amounts to $14,499,979, exclusive of the catch in Manitoba and the Northwest territories, of which there are no returns.

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High Waves on Lakes.

The recent storm wave on Lake Erie has called out the following account of earlier waves of like character, first printed in the Cleveland *Leader:*

"On Lake Superior, in 1789, opposite Isle Royal, there was a sudden fall of four feet in the waters. When they returned they did so with a rush, the vibration continuing for several hours. In 1834 the waters above the Sault Rapids suddenly receded, and in half an hour returned with great velocity. In August, 1845, Dr. Foster states that while in an open boat between Copper Harbor and Eagle River, an enormous surge twenty feet in height and crested with foam rolled toward the shore, succeeded by two or three swells. Dr. Foster observed repeated flows and reflux of the waters in 1847, 1848, and 1849, which preceded or followed storms on the lake. In 1851 D. D. Brockway reported, in a perfect calm, a sudden rise of one foot and three inches, and in another two and one-half feet. The *Lake Superior News*, of July 17, 1855, reports extreme fluctuations between the hours of nine in the morning and four in the evening. Father Andre, in 1670, while on Green Bay, reported a three foot rise, but this was accompanied by a northwester. On April 14, 1858, the Milwaukee *Sentinel* reported a change of level in Lake Michigan of six feet. May 10, 1823, according to DeWitt. Clinton, at Otter Creek, on the Canada shore, a wave came in nine feet high, and the same occurrence took place at Kettle Creek, twenty miles distant. Another in 1830 reports three waves at Madison Dock, Lake Co., O., the first rising fifteen or twenty feet. In 1844 or 1845 a wave came into Euclid Creek fifteen feet in height, carrying everything before it. On November 15, 1845, the water at Cleveland suddenly fell two and eight-tenths feet during a high wind from the southwest. The Toledo *Blade* records a change of ten feet on December 5, 1856. On June 15, 1872, at Charlotte, which is at the mouth of the Genesee River, the water rose twenty-two inches. In May, 1855, the waters of Seneca Lake exhibited a like phenomenon of continued rise and fall of sixteen and a half inches to two feet through two days. Similar agitations of the waters have been observed in Lake Geneva, in Switzerland."

Electric Storage.

At a recent meeting of the London Physical Society, Mr. Bosanquet described his application of the Faure accumulator charged by a dynamo-electric generator to the working of laboratory apparatus instead of the usual Grove or other battery. The net result of his experiments is that the accumulators charged for two hours have sufficient energy to keep the apparatus employed running for a week, and hence it is unnecessary for him as heretofore to put up thirty Grove cells each day.

Prof. Perry observed that a well made Faure cell, having the minium laid on in a uniform coat, does not lose its charge nor develop local action as is done by those accumulators in which the minium is put into holes in the plates.

Prof. Clifton described some ingenious devices adopted by him in lecture experiments on electrostatics. These consisted of insulating glass stems with glass cups, to hold sulphuric acid formed on the stems; also a form of key which, by rapidly succeeding contacts, brings the spot of light on the electrometer scale to rest without tedious swinging. He also described a form of lecture galvanometer, sine, or tangent, which could be readily shown in all its working to a large class, and exhibited a simple and inexpensive apparatus for measuring the focal length of a lens in six different ways, according to what is known about the lens. The results showed that the apparatus was very accurate in its indications.

Important Patent Decision.

In the case of the Detroit Lubricator Company against the American Lubricator Company, February last, in the U. S. Circuit Court, Eastern District of Michigan, before the Hon. Judge Brown, a verdict was rendered in favor of the American Lubricator Company, confirming and re-establishing their rights.

Judge B. F. James.

Judge James was, early in 1861, appointed by President Lincoln an examiner in the United States Patent Office, faithfully serving as such for more than eight years, when he became a member of the Board of Appeals, retiring from this position to take up the practice of patent law. For years past he had been suffering from a fatal attack of heart disease, to which he succumbed, June 26, at Washington, D. C.

Ingenuity Misapplied.

For two years the officers of the National State Bank, of Elizabeth, New Jersey, have been puzzled by the disappearance of cash from the drawer of the paying teller during business hours. A change of tellers did not stop the thefts. The detectives could make nothing of the mystery further than to establish an overwhelming probability that the robbery was effected by some one in the employ of the bank.

Recently, while attending to a customer of the bank, the teller thought he heard a mouse in the cash drawer. Opening the drawer quickly a thin line snapped, and he saw lying on a pile of $20 bills a small flat piece of lead, about an ounce in weight. On examination, it was found that one face of the lead was coated with gutta percha daubed with soft shoemaker's wax. The officers of the bank were summoned, with two detectives, and the cash was counted, discovering that thirteen $20 bills had been abstracted that morning. Further examination of the drawer discovered a thin fish line running through two screw rings, one in the under surface of the counter over the middle of the drawer, and another behind the rear of the drawer. There was a space between the top of the money drawer and the counter, concealed, of course, in front. In the floor there was an old gaspipe hole, left there after some alterations in the arrangement of the office furniture. This was in such a position relative to the cash drawer, that lines reeved through both the screw rings could be so worked as to drop in the lead upon the bills by one movement, and carry it out again by a reverse one, a bill being attached, of course, during the latter movement. It was plain that the work was done from underneath the office, and to this place nobody had access but the janitor, who was arrested and confessed his guilt. He had stolen in this way about $2,000. The device showed ingenuity, which, if turned to honest ends, might have made the thief a useful and successful inventor.

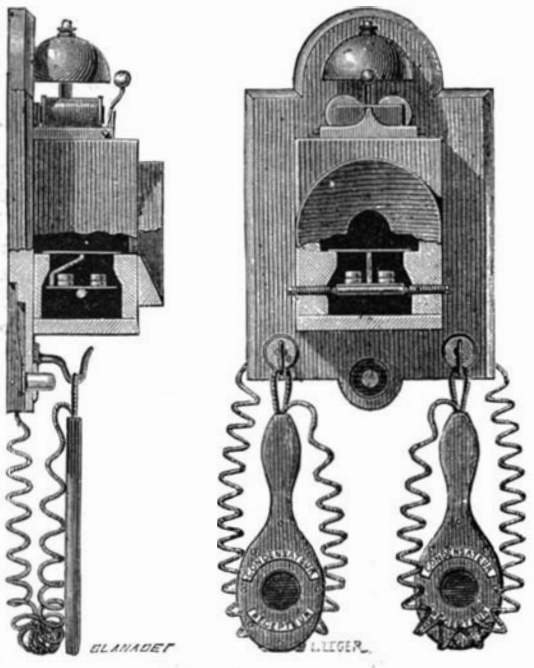

Fig. 1.

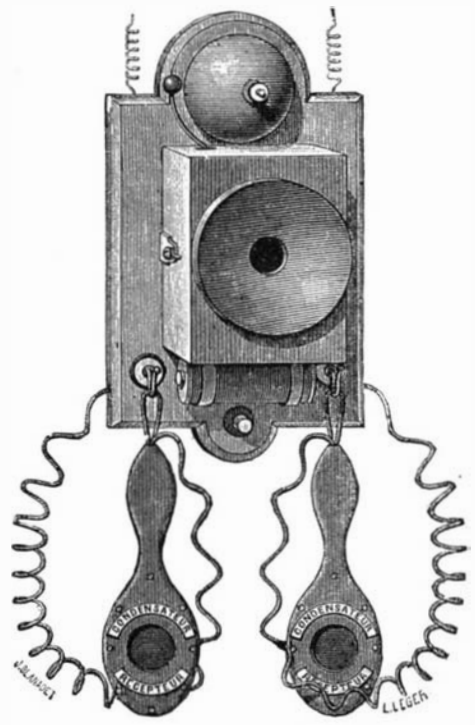

Fig. 2.

HERZ'S LONG DISTANCE TELEPHONE.

THE TELEPHONIC SYSTEMS OF DR. HERZ.

M. du Moncel has thoroughly studied the different telephonic systems of Dr. Cornelius Herz, and the object of the present article is to describe some new experiments, and especially the efforts which have been made to simplify the apparatus and give it a practical and convenient form.

The apparatus represented in Fig. 1 is specially designed for lines most affected by induction, which renders communication impossible with ordinary telephones.

This plan utilizes two principles discovered by Dr. Herz: the alternation of the current in the line, and employing condensers as receivers. The instrument constitutes a station, completely inclosing, under a compact and appropriate form, all the parts necessary for the call and for communication.

The diaphragm is horizontal, but a funnel placed in front of the box collects the sound and concentrates it upon the diaphragm, and the instrument will transmit words spoken fifty centimeters from it.

Four pairs of microphonic contacts are placed upon an oscillating platform, under the diaphragm and connected with it by a rigid rod, communicating to it all the vibrations of the diaphragm. These contacts are of a special composition, and communicate with the battery and with the line.

In this apparatus it is not necessary to use the induction coil, but it is necessary that the number of elements of the battery in the line be proportioned to the distance of the two stations; for example, between Paris and Orleans it was necessary to use thirty elements of Daniell at each station, in order to obtain the maximum intensity. Besides, the condensers have to be charged, in order to reproduce speech, so that it is necessary to employ another battery which is interposed in the line. It would seem at first sight that the number of elements employed would perhaps be an obstacle to the use of this apparatus, but it must not be forgotten, on the one hand, that the battery designed to charge the condenser, working always in an open circuit, costs very little, and on the other hand, the instrument is designed to work over lines where the employment of magneto receivers would be impossible.

Figures 2 and 3 represent an apparatus where the alternation of the current is accomplished in a different manner, and in which the induction coil is used in order to diminish the number of elements necessary in a long line.

Originally this instrument was formed of a vibrating plate, having at each side a contact point touching the diaphragm lightly, and the vibrations increased or diminished the pressure alternately upon each one of these contacts, but this form being inconvenient, M. Herz preferred that which is represented in Figs. 2 and 3, which gives the same results.

The vibrating plate, A, is of conducting material. Below, and touching it lightly, is a cylinder, B, which rests upon a disk, C, the two being made of the same material as the plate. The disk, C, rests, in its turn, upon a thin metal spring, which is made adjustable by means of a screw, so as to vary the contact between the three pieces, A, B, C.

The plate, A, and the disk, C, are connected with one of the poles of a battery of four elements, which is grounded at the center. Finally, the cylinder, B, is connected with one of the extremities of the primary wire of the induction coil, the other end being grounded. The secondary wire of the coil passes out from one side to the line, and from the other side to the ground.

It may be seen by referring to Fig. 4 what occurs when the instrument is spoken to. The vibrations determine alternately the increase and diminution of pressure upon the cylinder, B. During the first vibration the power of conducting electricity increases suddenly at A (Fig. 4), while the inertia of the cylinder, B, prevents increase at C, the current follows the route, A, B, P, to the ground. On the contrary, in the second vibration the power of conducting electricity diminishes at A, but increases at B, and the current follows the route, C, B, P, to the ground. It may be seen that during these two phases there are alternating currents passing through the primary circuit of the induction coil, and that in the secondary circuit there will be produced four impulses, two in one direction and two in the opposite direction, passing over the line. By this arrangement the telephones are placed in a derived circuit between the line and the ground. This instrument has always given very good results upon a long line, of which the static charges are often considerable.

Another arrangement has been given to the same instrument which does not work with alternating currents, but as an ordinary microphone having great power. This arrangement is represented in Fig. 5. The current enters through the cylinder, B, and issues through the contacts, A and C, and is delivered to the primary circuit of the two induction coils, then to the ground.

The secondaries are independent, as the sketch indicates, or arranged upon the same circuit; in either case they are

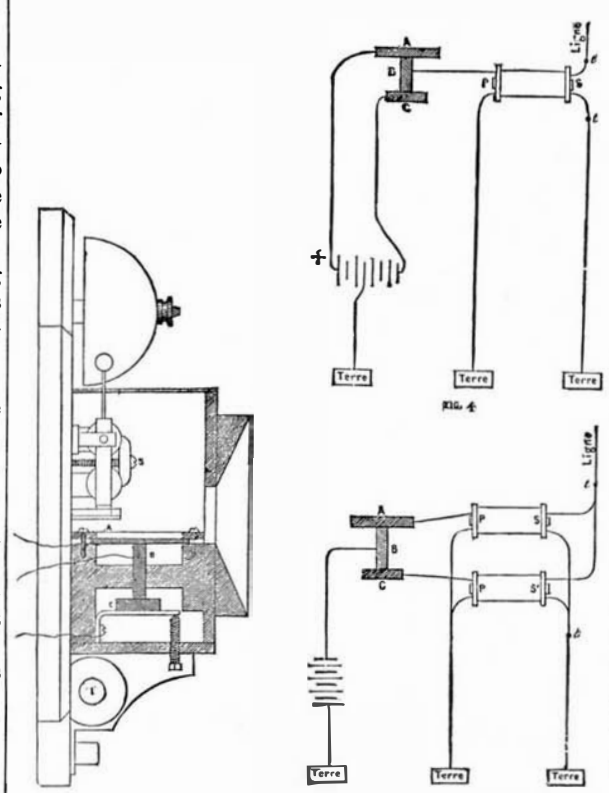

Fig. 3.

Fig. 5.

HERZ'S TELEPHONE SYSTEM.

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connected with the line on one side and with the ground on the other. The engraving of this apparatus will show how the distribution of the current is made, and in order that the instruments may give good results it is indispensable that there should exist a certain relation in the resistance of the coils, between themselves, and the coils with the line.

Another principle has been utilized by M. Herz, to augment the power of his telephones: it is that of derivation from the ground. Fig. 6 represents an apparatus which is based upon the principle of derivation. Under the vibrating plate are four pairs of contacts arranged as in Fig. 1, but with different electrical connections. The four lower contacts are connected together, and the four upper ones also, in such a way that all the pairs work together without producing an alternating current. Fig. 8 shows how the instruments are arranged in two corresponding stations.

When the two receivers *t*, *t'*, are hung up, each one of the stations may call the other by pushing on the button, C. When the station called has responded, the telephones are taken down; this changes the switches, and conversation may be carried on by the two instruments. Suppose, at first, that the station at the right speaks, the current from the battery, P, passing by the contact, *t'*, re-established by the raising of the telephone, is divided, the one part passing to the line, and the other to the microphone, M, then to the ground. The variations of conductivity produced by the microphone in the derived circuit, M, T, will be varied in the same manner as the current of the line of which the resistance is constant.

At the receiver of the other station, the current from the line passes in at C, then into the telephone, and finally to the ground, the lever, *t'*, having established the lower contact.

The apparatus described is placed horizontally, and may be spoken to directly over the diaphragm, but it may also have a vertical form as shown in Fig. 7; this arrangement, however, is only on the outside, and does not change the interior arrangement of the horizontal plate and the contacts.

The instruments which are the subject of this article put in practice three principles adapted to facilitate communication in various circumstances. These principles are the employment of condensers as receivers, the alternation of the current in the line, and the system of derived circuits. This does not form, altogether, a new method of telephonic communication, but either of them may be employed in cases where their application is specially indicated, and they constitute an important modification of the telephone.—*A. Noaillon, in La Lumière Electrique.*

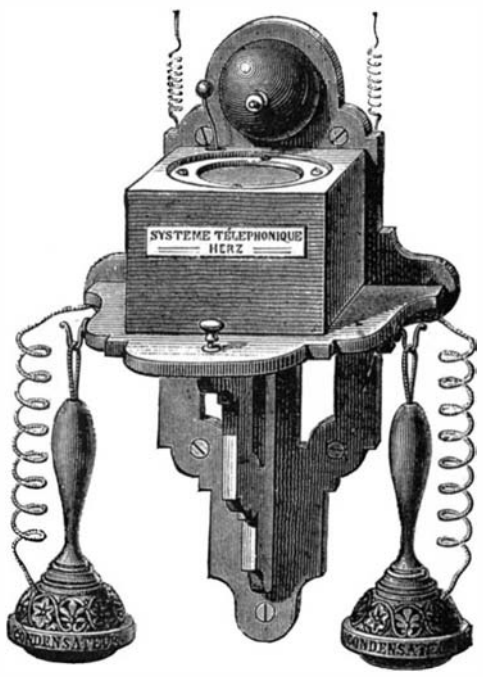

Fig. 6.

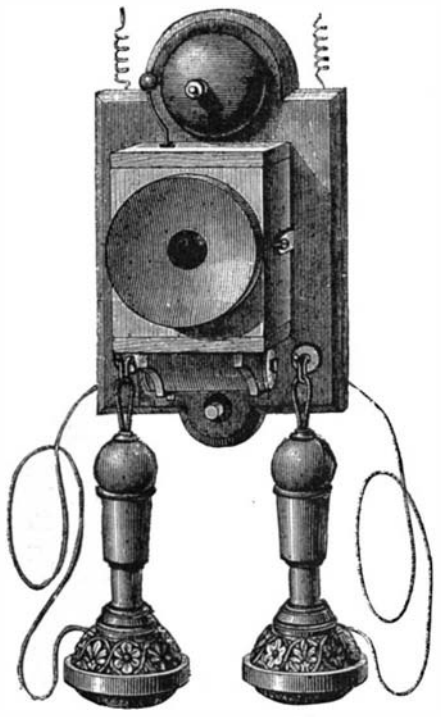

Fig. 7.

HERZ LONG DISTANCE TELEPHONE.

Researches on Lung Disease.

Fresh proof has lately been obtained by M. Giboux, of the danger in air expired by consumptives. He experimented with four young rabbits of the same litter, and born of healthy parents. Two of them were kept 105 days in a large wooden case, with side gratings, into which was introduced daily a quantity (about 20,000 cubic centimeters) of air expired by animals in a consumptive state. This operation was performed at midday and in the evening, and each time the gratings were kept closed for two hours. In another quite similar case, the two other rabbits were similarly treated, except that the impure air was made to traverse in its way to the case some wadding impregnated with carbolic acid. The rabbits in the first case, before long, showed loss of appetite, intense thirst, listlessness, diarrhea, and loss of flesh. On being killed, both were found to have tubercles in the lungs, the liver, and the kidneys, those in the lungs being the most advanced, and the upper lobes being chiefly affected. The other couple of rabbits presented nothing abnormal while alive, and no organic alteration was observed in their organs after death. They were eaten without repugnance by the author and his family. Again, observations have been recently made by MM. Gréhaut and Quinquand, both on man and the lower animals, regarding the influence of injuries of the lungs (or of the bronchiæ or the pleural envelope) on the exhalation of carbonic acid. They prove that the amount of this gas exhaled is less where such disorder exists, even where there is fever. Two explanations are conceivable: the pulmonary change might bar the elimination of carbonic acid, which, in that case, would accumulate in the blood, or the injury might have the effect of diminishing the production of carbonic acid by affecting the general nutrition. Experiment favored the latter hypothesis.

THE *London Lancet* says that muscarine, the active poison of mushrooms, is directly antagonized by atropia.

A New and Cheap Method for Enameling Water Pipes.

Two inventors in Bohemia have patented a direct process for enameling cast iron pipes, which can be applied to other hollow castings that are made with cores. It consists in simply covering the sand core with the enamel and then pouring in the iron as usual. The heat of the melted iron fuses the enamel, and it attaches itself firmly to the iron, and detaches itself so completely from the sand that the enamel is said to be all that can be desired for water-pipes and other industrial purposes. In casting sinks, basins, urinals, etc., the enamel can be applied to the sand on that side of the mould which is to form the inside of the basin.

The composition of the new enamel is kept a secret, but is said to differ from the old form in the simplicity of its preparation and the extraordinary cheapness of the materials used. It is so cheap that it has found very extensive use in many branches of industry.

In color this new enamel is gray. It will be useful for gas pipes as well as water pipes, because it will make the pipes absolutely tight by this glassy lining. It will be no less useful for soil pipes, which are always liable to corrosion from the gas they contain, but for conveying acid liquors, like mine-water, and in chemical works, for sinks and waste-pipes in chemical laboratories, it should displace lead, glass, or terra-cotta.

The Fluid Density of Metals.

A paper on this subject was lately read before the London Physical Society, by Mr. T. Wrightson and Professor W. Chandler Roberts, F.R.S. The results were obtained by the process described in a former paper to the society on the fluid density of bismuth. The mean results were: For copper, 8·217; lead, 10·37; tin, 7·025; zinc, 6·48; silver, 9·51; iron (No. 4 Foundry Cleveland), 6·88. These results are slightly less than those given by Mallet's process, but they are sufficiently close. For bismuth the fluid density found by the authors is 10·055, which is slightly more than that given by Mallet's method (9·82). The authors consider their method satisfactory. It consists in suspending a ball of the solid metal from a spiral spring, and allowing it to dip into a crucible of the same metal in a molten state. The movements of the spring as the ball melts are recorded by a pencil on a band of traveling paper.

THE fastest regular time known to be made by the passenger trains from Jersey City to Philadelphia, 90 miles, was 1 hour 50 minutes.

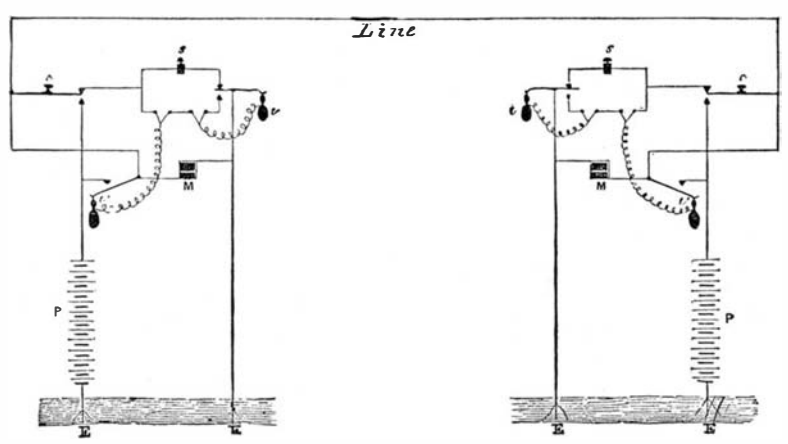

Fig. 8.

HERZ TELEPHONE SYSTEM.

Northern Chili.

The country which looks so narrow upon the map has nevertheless a breadth of 150 to 170 geographical miles, and rises with alternating hill and valley to the Cordilleras. This situation, between the Cordilleras upon one side and the quiet Pacific on the other, produces a climate which is very moderate for that latitude. The greatest heat in summer is 78° to 80° Fahr.; in winter nights it freezes, but as soon as the sun rises the cold is reduced to a very pleasant temperature. Certain kinds of palms grow very well in this climate. A remarkable uniformity prevails in the atmosphere, gentle land breezes by night, and sea breezes by day, are repeated day after day with a shining sun and clear only slightly clouded sky. A few times in winter the sky is thinly clouded over, and a strong, cold, moist north wind prevails, which brings with it a few hours of rain, but it does not penetrate more than an inch into the earth. Perhaps once in twenty years a spell of rainy weather sets in, which produces snow in the higher regions, while in the valleys there are heavy rain torrents, producing frequent brooks and rivers, with deeply excavated beds, which are left dry again in a few days, and usually remain thus dry for the next twenty years. After such a rain the hills and valleys become covered with flowers and plants, which continue to grow for several years with no other nourishment but the strong night and morning mists peculiar to the deeper regions. Otherwise the land from far south of Copiapo northward to Peru is a perfect desert. Even moss is rarely found on the mountains. The mountain chains, with their gaudy colors, stand forth totally barren of vegetation. Granitic and syenitic mountains, with frequent sand-filled cliffs, valleys covered with bowlders, clay, and sand, are seen. The valley of Copiapo, irrigated by a river of the same name, which receives its waters from the snowy regions of the Cordilleras, makes a very pleasant impression. By artificial means the water is spread over a broad stretch of country which then yields a rich harvest of fruits, vegetables and barley; wheat, rye, and oats are not cultivated here. The soil is so fertile that any addition of fertilizers is totally unknown, and yet barley produces a yield which would be thought impossible in Europe. Outside of this valley, and a very few similar ones, there is, of course, no agriculture in this desert. But on the other hand this region is very rich in mines, which frequently occasion the building of a small mining town, but just as frequently they exist without any animal or plant life. The population consists of a mixture of the long since extinct original Indian stock with the later immigrating Spaniards.

The Cordilleras, as is well known, extend north and south, and parallel to these and to the coast are the different geological formations which occur here. A vertical section from the coast to the peak of the Cordilleras would cut through all the strata, whereby a glance at the formation of the mountain would be possible. Next to the coast are the oldest stratified rocks, consisting of clay and quartz shale, without any fossils, and in which as yet there are no mines, but not destitute of metalliferous veins. The Chilians call this the gold formation! On the coast this is broken through by light colored granites; on the east it is bounded by a later diorite, which is 10, 16, or 20 miles from the coast, and parallel to it. This is the matrix in this part of Chili for the numerous kinds of copper ores, which makes Chili one of the largest copper-producing countries of the earth. The gangue is chiefly quartz. Deep down below the surface the ore is always copper pyrites, but above this, and near the surface, are all possible products of oxidation. Descending from above the ores appear in the following order: first, silicate, carbonates, and chlorides, then red oxide, next the black oxide (frequently in large masses), then kupferglanz (calcocite), and finally copper pyrites, with iron pyrites. Native copper is also found mixed with the ores, sometimes in pieces as large as the hand. These veins never contain galena, blende, arsenic, or silver, but, on the contrary, some gold. Beside the regular veins, pockets of wonderful richness are also found, as, for instance, the mine at Corrizabilo, north of the Chaneral. This lies on the boundaries of the porphyry, and produces monthly 15 to 20,000 cwt. of copper pyrites, containing 20 to 25 per cent of copper. The supply of metal is sufficient for a six years' run; a production of 216,000 cwt. in six years. The diorite is penetrated by numerous veins of greenstone, both older and younger than the veins of copper ores.

Eastly from the diorite we strike upon an eruptive formation, which consists at first of impure limestone, with ammonites; above is a stratum of porphyry conglomerate; between these appears a sandstone formation with argillaceous shale, in which is found the anthracite. Above the conglomerate again is a light marl and clay shale, with numerous ammo-

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nites, belemnites, etc. This whole formation is penetrated with porphyry, with and without quartz, with and without mica, with and without hornblende, and is frequently broken through by hornblendic granite in mighty veins, which also very frequently form the highest peaks of the isolated mountains formed by erosion, while farther down they consist of shales that contain ammonites. Farther in the Cordilleras these secondary strata are also broken through by the diorite. In the above mentioned impure limestone, in a line from 30 to 60 miles from the coast, occur a greater part of the silver mines of Chili, including the celebrated Chanereillos mine, which has produced, since its discovery in 1834, over $100,000,000, but is now almost entirely exhausted. Some of these mines are 500 meters deep, and no ore has been found for the last 100 meters. The adjoining rock at this depth is totally different from that near the surface. In the porphyritic conglomerate, too, there are single mines of silver. The previously mentioned occurrence of anthracite has as yet been but little investigated. In the upper marl and shale strata are poor veins of lead ore, which are only seldom worked. In the porphyry, too, there are silver veins, for example, the mine Buena Esperanza, at Tres Puntos, which has yielded $16,000,000 since it was discovered in 1848. The most common ores of silver are horn silver, native silver, and ruby silver ore. Both in the stratified secondary formation, as well as in the irruptive porphyry, copper veins are met with, which differ from those in the diorite in this, that the gangue rock consists of calcspar instead of quartz, and that they contain in addition to the chief ore of pyrites, also fahlerz and argentiferous galena. Copper veins also occur in the diorite which penetrates the secondary strata further into the Cordilleras, but these are analogous to those that are found in the diorite on the coast.

These eruptive and shale formations form the principal mass of the western slope of the Cordilleras up to a height of 16,000 feet, but at a greater height they are unknown.

The ore veins may be classified as follows:

1. Quartz veins in diorite, with copper pyrites (and copper oxides), sometimes auriferous, but never argentiferous.

2. Calcspar veins in porphyry and stratified secondary rocks with argentiferous copper ores.

3. Limestone and barytes veins, likewise in porphyry and stratified secondary formation, with free-milling silver ores, some of them also auriferous.

4. Galena, with a little silver in the upper secondary marl and clay shale, not much worked.

5. Quartz veins in granite, with gold and some copper, but no silver. Its occurrence is not more nearly known; probably they will also appear in the later granite, which breaks through the oldest shale and has given to this formation the name of "gold formation."

Up to a height of 11,000 feet are found large alluvial and diluvial formations, consisting of stone, sand, and marl strata of considerable thickness, with single subordinate strata of trachytic tufa, and frequently covered over with trachytic porphyry with sardine crystals and pitchstone porphyry.

At a height of 8, 10, or 12,000 feet above the sea is found a series of half dried up salt lakes, without outlet, and from 40 to 50 or more miles in length. These lakes have abundant feeders, but the air is so dry and the evaporation so great at this height that an equilibrium is always maintained between the influx and evaporation. In the neighborhood of one of these lakes, very recently, a company found an immense mass of a borate of lime and soda, in layers alternately with common salt (soda chloride); still more recently a similar strata has been found at another salt lake, which lies near the projected railway over the Cordilleras, and it is very probable that still more will be found.

The eruptive nature of the trachyte surrounding these lakes, and the formation of borax now seen at the hot springs of Tuscany, permit us to conjecture that a similar formation is to be expected here. The present relations of the strata are explained by the evaporation of a former much larger salt lake, to which is ascribed the presence of some large salt deposits in the secondary formation, while others suppose that they are the remains of the large sea which in a comparatively recent time covered the Cordilleras to a height of 11,000 feet.

The trachyte which covers the alluvial strata is purely crystalline, and was formed after the eruption. Mr. Sandt, who observed these upon the spot, explains their occurrence as follows: Up to the time of the tertiary the Cordilleras stood under water to a depth of 11,000 feet, and then arose simultaneously with the eruption of the trachyte.

The alluvial formations are not a local formation, nor as such peculiar to the salt lakes mentioned, but they have here an extraordinary extension and contribute essentially to impart to the Atacama deserts the character of a mountain slope, from which the peaks emerge like islands. The borax mineral consists of borate of lime, borate of soda and water, is amorphous, snow white, has the luster of silver, and contains 30, 40, or 50 per cent of boracic acid, as it seems to consist of several varieties, with varying quantities of water and lime.

That an actual, real, epidemic fever should prevail in a country so rich in ores and mineral treasure, might be expected. Under the influence of this fever the search for ores and attempts at opening mines have been made, and our knowledge is derived rather from reports than from careful mineralogical and geological study. Although many of these stories are false, yet there is truth enough to cause large caravans to be fitted out, which endure cold, hunger, and other dangers to find these treasures. But many of the most celebrated mines in North Chili owe their present existence to the fever and its consequences, else they had long since been exhausted. So too the above-mentioned borax deposits, which are wonderfully rich. Yet in spite of all difficulties of a long transport to the sea coast, borax can be obtained thence more cheaply than from any other place. It has been suggested that this may produce a revolution in some of our metallurgical processes, when, in a few years, perhaps better means of transportation shall be introduced there. Over $100,000 has already been expended in making new roads and in preparing the impure mineral for shipment, such as expelling the water of crystallization, although the specific gravity of the mineral is so small that the cost of transportation is not very great.

Two Live Brant.

Mr. Frederick Mather, Assistant United States Fish Commissioner, has two live brant which he will try to have mate and breed at his trout farm on Long Island. They were wing-tipped last winter on the Virginia broad-water by a New York sportsman who was shooting there, and after a hard chase they were captured in shoal water and confined in a pen. Although, from time to time, brant have been domesticated both here and in Europe, they have never been known to follow the example of the other varieties of geese by breeding in confinement. As yet their nesting resorts have never been discovered by ornithologists or arctic explorers. Indeed, the surmises that there are open seas at the Pole has been principally based on the observations made of the habits of this mysterious fowl. As far north as the explorers have reached the brant have still been seen winging their way northward. Their food is known to consist mainly of marine grasses, which grow only on the shoals. This, perhaps, points more to open seas at the extreme north than any other evidence yet brought to light. On the day after the geese were secured they became very tame, and almost instantly recognized the person who fed them. They would run to the side of their inclosure and take sea grass and cabbage leaves from his hand. They arrived here recently from the South in fine condition, and when given their liberty they at once proceeded to eat a good breakfast of corn and make their toilets. Of all the five varieties of geese this fowl is the most beautiful. At this time brant are migrating northward, where they will meet the ice on the coast of Labrador. It is presumed that they descend from their aerial route and feed at the springs above Hudson Bay and in Greenland.

New York State Firemen's Convention and Exhibition.

A prominent feature of the coming Convention of the New York State Firemen's Association, in Rochester, will be an exhibition of fire engines and apparatus. The central committee have secured a capacious and centrally located exhibition building, having 100,000 square feet of area, the five floors being connected by elevators and well lighted and ventilated.

On the first floor are the offices of the Central Committee, Western Union Telegraph and Rapid Telegraph Messenger Service; also a display of steam fire engines, hand engines, and hook and ladder trucks The second floor will contain the hose carriages, fire escapes, extension ladders, chemical extinguishers, florists' display, and firemen's periodicals. The third floor will be devoted to hose, nozzles, valves, hose attachments, firemen's uniforms, badges, rubber coats and hats, and every description of small merchandise used by firemen. The fourth floor will be used as a convention hall, with special accommodations for delegates and reporters. On the fifth floor will be found the reception parlors and banquet hall for the special use of visiting delegates.

The building will be open for the reception of articles August 12, and all exhibits must be in position and ready for exhibition on the opening day. Machinery and manufactured articles must be entered in the name of the manufacturer. Entries will be permitted by manufacturers' agents and through their accredited representatives. All articles on exhibition must remain until the convention closes.

No charge will be made to exhibitors for entries or space for exhibits. The expense of the exposition building will be wholly assumed by the Central Committee. The committee will take charge of all articles upon which the freight has been prepaid, and remove them to the exhibition building at the expense of the exhibitor.

The Secretary of the Central Committee is H. W. Mathews, Rochester.

Another Application of Electricity.

The call for an electrical sheep-shearer, made by a New Zealand correspondent in these columns some months ago, has apparently brought forth fruit in an unexpected quarter.

The head of the Hudson Bay Fur Company of England is Sir Curtis Lampson, by birth a Vermonter. It is now announced that he has applied electricity to the trimming of seal skins. The skin is "fed" over a knife-edge bar, above which is stretched a fine platinum wire, which, raised to a white heat by an electric current, meets the longer hairs which rise above the under fur, and mows them down.

A PETROLEUM pipe line, constructed from the Couban oil territory over the Caucasus Mountains to Novoroszisk Harbor on the Black Sea coast, was opened on May 27. This line of pipe, which is 105 miles long, can deliver every day not less than 1,000,000 pounds of petroleum.

A Perpetual Motion Clock.

In September last, a new perpetual clock was put up at the Gare du Nord, Brussels, in such a position as to be fully exposed to the influence of wind and weather; and although it has not since been touched, it has continued to keep good time ever since. The weight is kept constantly wound up by a fan, placed in a chimney. As soon as it approaches the extreme height of its course, it actuates a brake, which stops the fan; and the greater the tendency of the fan to revolve, so much the more strongly does the brake act to prevent it. A simple pawl arrangement prevents a down draught from exerting any effect. There is no necessity for a fire, as the natural draught of a chimney or pipe is sufficient; and if the clock is placed out of doors, all that is required is to place above it a pipe, 16 or 20 feet high. The clock is usually made to work for twenty-four hours after being wound up, so as to provide for any temporary stoppage; but by the addition of a wheel or two, it may be made to go for eight days after cessation of winding. The inventor, M. Auguste Dardenne, a native of Belgium, showed his original model at the Paris Exhibition of 1878; but has since considerably improved upon it.

Carbons for the Electric Light.

At a meeting of the Paris Academy of Science, M. Jacquelain pointed out that carbon for the electric light should be purer than that obtained by calcining wood; and, if not free from hydrogen, should, at any rate, contain no mineral impurities. There are three methods for accomplishing this result: (1) By the action of a jet of dry chlorine gas directed on the carbon, raised to a light red heat; (2) by the action of potash and caustic soda in fusion; and (3) by the action of hydrofluoric acid on the finished carbons. M. Jacquelain has prepared carbons by all three methods, and has summed up in a table the photometric results of his experiments. He comes to the conclusion that the luminous power and the regularity of the voltaic arc increase in direct ratio to the density, hardness, and purity of the carbons. He remarked, incidentally, that the natural graphitoïd of Siberia possesses the singular and unexpected property of acquiring by purification a luminous capacity double that which it has in the natural state, and which exceeds by one-sixth that of pure artificial carbons.

Fall of Meteors.

The master of a ship which arrived at Dundee in June, reported that when his vessel was in latitude 51° S. and longitude 80° W., an immense meteor of amazing brilliancy fell into the sea within a few cables' length of the ship. As it plunged into the water it made a roaring, hissing noise, just as a great mass of red-hot iron would when extinguished. The second officer, Mr. John Veitch, took particular notice of this remarkable appearance, and of the noontide effulgence which the fiery body cast upon a broad space of the sky, and supplemented the entry of the occurrence in the log-book by saying, "that possibly some ships that had gone amissing may have been struck and sent to the bottom by such meteors."

Since then a similar case has been reported nearer home. On the last night of June a great and brilliant meteor was seen to fall into Muskegon Lake, the harbor of Muskegon, Michigan, near the shore of the lake of the same name. The aerolite struck three or four hundred feet out from the shore, causing a great commotion in the water. The shock was heard throughout the city, arousing those who had not been startled by the glare.

A Rope from Sheep's Entrails.

A strong and durable article of belting is made at Oakland, California, out of the entrails of sheep.

The entrails, which will average about 55 feet in length, are first thoroughly cleaned and then placed in vats of brine, where they remain some days. When thus prepared they are not much thicker than a piece of common cotton twine, and will sustain a weight of about ten pounds. The next stage in process of manufacture is to wind the prepared material on bobbins, after which the process is the same as in making common rope. This method is used to produce a round belt; but where a wide flat belt is to be made a loom is employed, and the fine strands are woven together, as in ribbon manufacture. The flat belts are made of any size, and the round of sizes varies from one-sixteenth up to one and a half inch in diameter. The round belts are made either in the form of a smooth cord, or as ropes with from three to five large strands. The three-quarter inch rope is said to stand a strain of seven tons, and is guaranteed to last ten years.

Embalming in Italy.

The *Lancet* describes the chief processes employed by the principal Italian embalmers; the special processes are kept secret. First, cold water is injected through the whole circulatory system, until it issues quite clear. This may take as long as five hours. Alcohol is then injected for the purpose of abstracting all the water from the body. This is followed up by the injection of ether, to dissolve out the fatty matter. After this a strong solution of tannin is slowly injected, and full time is allowed for its soaking into all the tissues; this takes from two to five hours. Lastly, the body is exposed for from two to five hours to a current of warm air, which is previously dried by passing it over heated chloride of calcium. The body can then be preserved for any length of time and is as hard as stone.

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Correspondence

A Supposed Meteor.

To the Editor of the Scientific American:

On the evening of the 6th, while engaged in "sweeping" the vicinity of Ursa Minor for double stars, my attention was drawn to a bright object about the size of a star of the second magnitude moving slowly from west to east. It passed within a degree of Polaris and continued steadily in its course eastward, disappearing from view in the neighborhood of Capricornus. In color this object, a meteor doubtless, was deep red, without scintillations or train of any kind, and its slow movement was in marked contrast with the rapid flashing of the common "shooting star." It was visible to me fully three-fourths of a minute, varying but slightly in brightness during that time. In the closeness of my attention to its movement I neglected to note the time of its appearance, but judge it to have been near half past ten. Perhaps there were others of your readers who observed the phenomenon, and can add more specifically to my testimony.

N. S. DRAYTON.

Jersey City Heights, July 8, 1882.

Notes on the Habits of Some Western Snakes.

BY H. A. BRONS.

While connected with the Geological Survey of the Western States, I had the opportunity to note some peculiar, and as far as I am aware, unreported habits of some of the snakes.

Several of the summers I passed upon the plains were preceded by rainy springs, swelling to unusual height the small streams, which became inhabited by small fishes. During the drought of hot summers, the receding waters left the fishes in shallow pools within creek beds, an easy prey to their numerous enemies.

The mid-day heat caused numbers of snakes to seek shelter from the sun, and the garter snake (*Eutnœia radix*) in particular chose water at this time. Here the fishes, unable to escape or find deep cool water, were unwilling co-tenants with the snakes. The latter are fond of fish, and would devour great numbers of the smaller ones, chasing them from one part of the shallow pool to another. When the fishes were in water too shallow to swim in, or were struggling upon the sand, they would be seized by the snakes, who would feed upon them until unable to contain more. The snakes would follow the fish through the water, diving and remaining submerged some time. I did not observe them swallow air (see *Am. Nat.*, Jan., 1880). Snakes evince more than ordinary energy and sagacity in capturing fish; half a dozen will congregate within a small pool, all acting in concert.

Mr. J. L. Wortman, who had charge of a scientific party last year, informs me that while fishing one day he caught numbers of chub (*Cyprinidæ*), and, throwing them on the sand, was surprised to see that but few remained. While quietly continuing to replace those so singularly missing, he observed a garter snake seize and swallow one of the fish six inches in length. There were two of these snakes reaping the reward of Mr. Wortman's skill. Upon opening the snakes one was found to contain six fishes. The headwaters of the Smoky Hill and Big Horn rivers abound in this aquatic *Entœnia radix*.

In Texas, while fishing with a common hook and line, baited with a small scale fish, I had the rare fortune to hook what at first seemed to be an eel, but proved a "cotton mouth" snake (*Ancistrodon piscivorus*).

One morning, on examining a line set over night I found the pole as left the previous evening, but the line drawn to shore, and my curiosity was excited as to the catch. It proved to be one of these snakes, coiled upon the bank, the bait, a small scale fish, mashed within its mouth, and the hook well caught. Upon being disturbed it at first showed fight, but took quickly to water, and was landed with the same effort as a fish or eel of equal size, *i. e.*, about twenty-six inches in length. That season I caught three of these venomous snakes in this way while fishing with a hook and line. By Mexicans living on the banks of the San Antonio and San Miguel rivers, I was informed that it is no unusual thing to catch cotton mouths while fishing.

Running short of bait one day, I caught several large toads and tied them together by their hind legs. On nearing the water a snake started to cross the stream; having nothing else to throw at it, I gave the toads a toss in front, hoping to change its course; the snake seized quickly on the struggling mass. Toads exhibit great fear of snakes; it will afford considerable amusement to take a toy or stuffed snake skin and trail it toward one; it will make a strange cry, at the same time making vigorous jumps to escape. Frogs act in the same way, though they are not so readily captured.

Nearly all animals show unmistakable signs of fear when confronted by a snake, though many that do not prey upon them take delight in destroying them, as do the deer family, etc.

Prairie dogs (*Cynomys ludovicianus*) seem to have a most intense dread of rattlesnakes (*Crotalus confluentus*). This little animal dreads not only its venomous bite, but more the loss of its young, which serve as food for these snakes, that enter their burrows, take possession, and drive them from their homes. Where does one find a prairie dog town but that it is teeming with snakes and the strange little owl (*Speotyto cunicularia*), that "ducks" to passers in ludicrous solemnity? These, though billeted upon the dogs, do not constitute a "happy family." The owls, though they generally occupy an abandoned hole or burrow, destroy the young dogs. Nor do the eggs and nestlings of the owls fare with any better treatment from the snakes; between these exists much enmity. One afternoon, while passing through one of these dog towns, in Wallace County, Kansas, we heard a most unusual noise and stir (in the town), as though they were holding a bellicose council. They were collected around a hill,* into which they were scraping dirt vigorously. On examining the burrow, it was found to contain a large rattlesnake that the dogs were trying to entomb. I noticed this several times, as did other members of our party. To leave no doubt upon the subject we dug out the snakes after shooting them.

The habit of swallowing whole eggs is too well known to merit more than mention. But few persons realize the mischief snakes work in destroying the nests and young of our valuable birds. It is not an unusual occurrence to find whip (*Bascanium flagelliforme*), racer (*Bascanium constrictor*), and bull snakes (*Pityophis sayi*), with the entire contents of quail, prairie hen, or domestic fowl's nests within their capacious stomachs. With a little care they may be compelled to disgorge the ingesta unbroken.

During the breeding season the odor of many snakes is quite distinct and perceptible at some distance. This is markedly so in the rattlesnake (*Crotalus confluentus*), its musky and fœtid emanations are quickly recognized by frontiersmen.

The manner of union of the sexes at this season is rather instructive. The female among the racers (Bascanium) is larger and darker than the males, and not so graceful in form or movements, she, at times, seems to toy with the male, indisposed to yield to his importunities, though pressed with ardor. To avoid his suit, at times, she will dart through grass, among stones, or enter a crevice. Should he be able to reach his mate while within a hole, he is not slow in bringing her to the surface, again to be repulsed. Upon an unbroken ground the sexual communion is less prolonged. Here she is unable to free herself from his quick and effectively directed moves. In case she attempts to quit him, a coil is thrown about her body, and his head laid flat upon her neck, and replaced as promptly as dislodged, evidently in the endeavor to propitiate her.

Of all strange habits in snakes, none equals that observed in the blowing adder (*Heterodon simus*). One afternoon returning to camp, I came upon a box turtle (*Cistudo ornata*) trailing along one of these snakes, which had a firm hold upon the turtle's left hind foot. The turtle was unable to free itself of its tormentor, as its hold was quite secure; so persistently was it maintained that I lifted the turtle by grasping the body of the snake. Considerable force was required to separate them. The snake was about twenty inches long, the turtle eight inches. The foot was bleached, and blood was still flowing; none had apparently escaped from the mouth of the snake. Two toes were missing, having been digested from the foot. The entire foot appeared as though it had been subjected to a continued maceration within the mouth of the snake.

Twice afterward I noticed this strange habit of the puff adders. The late Professor Mudge mentioned to me that he had observed this habit in these snakes. I have not been able to find any signs indicating that the snake ever attaches itself to a fore foot. It seems as though they chose a foot that the turtle is unable to defend. The neck can not reach the hind foot as it can the front, and free it of any object that may attempt to lay hold upon it. The carapace may protect the tail.

I took pains to examine many box turtles (*Cistudo ornata*) that occur along the Smoky Hill rivers, and many, one can safely say one-half, are deformed in their hind feet. Very little deformity is found in the front feet. It must not be taken that all, or even a majority of these deformities, are caused by adders. It is not on account of want of food, for there is never a lack of the insects here upon which the snakes generally subsist. It is not thirst, as the habit is practiced where there is water. The appearance of the foot, and the inability of the snake to masticate, would preclude any solution other than the desire to obtain blood as it flows from the lacerated parts.—*Amer. Naturalist.*

* The prairie dogs throw up a bank levee about the mouth of their burrows

NATURAL HISTORY NOTES.

Filaria of the Black Bass.—At a meeting of the Philadelphia Academy of Natural Sciences recently (Proceed., p. 69), Prof. Leidy stated that he had been told that the black bass, *Micropterus nigricans*, in some localities, is much infested with a red threadworm. One procured in market for his table was found to be greatly infected. The worms were coiled in oval masses from the size of a pea to that of a large bean, and were situated beneath the skin, in the muscles, and under the membrane lining the abdomen. The worm is cylindrical, slightly narrowed, and obtusely rounded at both ends, minutely annulate, and otherwise smooth, pale red, bright red or brownish red, translucent, with the darker red or brownish intestine, and the white œsophagus shining through; mouth a small pore, unarmed; œsophagus long, capacious, cylindrical, straight or somewhat tortuous. Length from three to six inches, by half a line in diameter. The worm appears to be a *filaria*, but the determination of the species was left for more extended observation.

An Ancient White Pine.—The *Gardener's Monthly* states that a tree of remarkable dimensions was recently felled at Crystal Spring, Yates County, N. Y. The tree was perfectly sound and vigorous, thirteen feet in circumference at the ground, and nearly two hundred feet in height. The rings or annual layers in its stump indicate an age of three hundred and fifteen years, and it is estimated that four thousand feet of lumber will be cut from its trunk.

The Apteryx.—That curious bird, the apteryx, is still to be found in New Zealand, but it is probable that before many years it will, like the gigantic diornis of the same country, have entirely disappeared. It is poorly armed for self-defense, and the only thing that prevents its entire extermination is its retired and nocturnal mode of life. The number of these birds has diminished very rapidly since the colonization of the island, and from year to year it becomes more and more difficult to secure a specimen. Dogs and cats are their worst enemies, for they can not only discover them by their odor, but pursue them into retreats inaccessible to man. If we add to this constant destruction the fact that they reproduce their species at long intervals, and lay but a single egg, it may be readily seen that the entire disappearance of the bird is a question of comparatively few years. The egg of the apteryx is a genuine curiosity; and, when its size is considered, there is no wonder that this bird does not lay more than one. The egg is deposited in a burrow so difficult to discover that, in a journey of a thousand miles across New Zealand, Prof. Ward, of Rochester, was able to procure but two specimens. The natives tell a host of stories about this egg. Thus, they assert, for example, that the bird buries its egg to a certain depth in the ground and then makes a burrow under it so that she can enter the latter and let the egg rest on her back. This is a fable, however, for Prof. Ward observed the birds sitting on their egg just as others of their race do. The place of the apteryx in a system of classification is far from being determined in a satisfactory manner. It is usual to place it alongside the ostrich and cassowary, in the order of *cursores* or runners, because it is deprived of the faculty of flying. Prof. Ward seems to take this view of the case.

Chlorophyl-containing Animals.—As well known, there are certain animals, such as some infusoria, certain hydras, and a few worms of the group of Planarians, that contain chlorophyl in grains.

Mr. Brandt (*Botan. Zeitung*, 1882, No. 15) has just published some curious researches on this subject, which, if their results are verified, will prove of considerable importance. According to him, these so-called granules of chlorophyl are algæ parasitic on the animals in question, and, in some cases, he states, he has been enabled to isolate and cultivate them. Generalizing the facts observed, he concludes that we have here a curious association of an animal with a plant. The green alga is a parasite of worm, hydra, or infusoria; but from another point of view, the converse is true, since, under the action of light, the chlorophyl organisms assimilate the carbon of the carbonic acid and furnish it to the animals in which they are established. Mr. Brandt compares the animal thus provided with these sorts of *gonidia* to a lichen in which the fungus has been replaced by an animal. Mr. Brandt's conclusion is very clear; from a morphological point of view, these so-called chlorophyl granules are algæ; and from a physiological point of view, they are parasites of the animals.

Longevity of Ants.—Sir John Lubbock says, in the *Journal* of the Linnæan Society:

In my previous paper I have called attention to the considerable age attained by my ants; and I may perhaps be permitted to repeat here, *mutatis mutandis*, a paragraph from my last communication with reference to my most aged specimens, most of those mentioned last year being still alive. One of my nests of *Formica fusca* was brought from the woods in December, 1874. It then contained two queens, both of which are now still alive. I am disposed to think that some of the workers now in the nest were among those originally captured, the mortality after the first few weeks having been but small. This, of course, I cannot prove. The queens, however, are certainly more than seven, and probably more than eight years old. In the following nests, viz., another nest of *F. fusca*, which I brought in on the 6th June, 1875, and one of *Lasius niger*, on the 30th November, 1875, there were no queens; and, as already mentioned, no workers have been produced. Those now living are therefore the original ones, and they must be between six and seven years old.

I had also some workers of *Lasius niger*, which I began to observe on the 6th July, 1875; the last of these died on June 15, 1881; and some of *Formica cinerea* on the 29th November, 1875; the ants in this nest died off somewhat rapidly, the last on July 23, 1881. There were no queens in either of these nests.

Eight Preachers Once.

Eight clergymen preached simultaneously in the Eastern Penitentiary, Philadelphia, on a recent Sunday, to invisible audiences. This prison is conducted on the principle of solitary confinement. Each prisoner has his own lonely cell. These cells open on eight corridors, radiating from an octagonal center. The preachers stood at the outer ends of the corridors, and could be heard by the occupants of the cells in their several sections. A group of officials and reporters in the middle of the prison experienced the novel sensation of listening to eight sermons at once.

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BOURRY'S DYNAMOMETRIC GOVERNOR.

The great increase in the adoption of electrical illumination opens up a new field for this governor, which is claimed to be the only one, really practical, that permits of employing the electric light in many works where there is not always an excess of power available. By its aid the power not utilized during certain portions of the day may be automatically distributed among two or more electric generators, which will thus serve as accumulators of electricity, their stored up energy being rendered available for the requirements of illumination. The extreme sensitiveness of this governor also renders it especially useful in rolling mills, saw mills, and other cases where the resistance varies almost constantly, as well as in connection with marine engines. Instead of depending upon variations from the normal speed, the inventor, M. A. Bourry, of Saint-Gall, Switzerland, turns to account the dynamic effect produced by the torsile strain exerted on the shaft, and also the fact that this shaft is subjected to a rotatory force at one end and to a resistance at the other. As a rule, this torsile strain, being neither visible nor palpable, is not immediately utilizable; but, in order to make it serve for the desired purpose, it must be increased artificially, by concentrating it on a single point by means of springs judiciously applied, in the action of which is reflected, as it were, the resistance opposed to the motor. The arrangement adopted by M. Bourry consists in converting all circular strain into rectilineal pressure, which permits of applying the greatest number of the best springs known. These are placed round and near to the shaft, a practice that offers great advantages as regards distribution of the strain, facility of installation, and the replacing of parts. In this way, the inventor obtains a constant, durable, and compact dynamometer, together with a perfect governor, which may be applied to small powers as well as the largest engines, such as those of screw steamers, because it contains no part, without even excepting the springs, that cannot be made as strong as may be required.

The engravings show two types of this governor, applicable to all cases which may possibly occur. In the first arrangement, shown in side elevation at Fig. 1, and in plan at Fig. 2, the appliance is mounted on a special frame, which may be affixed to the floor, to a wall, or to the ceiling. An intermediate shaft is interposed between the motor and the driven shaft, and carries two pulleys, one of which, narrow and loose, receives the belt from the engine, while the other, double the width, for allowing of the manipulation of its belt, transmits the power to wherever it may be required This second pulley receives its motion from the first by means of a jointed coupling; and, in certain cases, the two pulleys may be replaced by geared wheels.

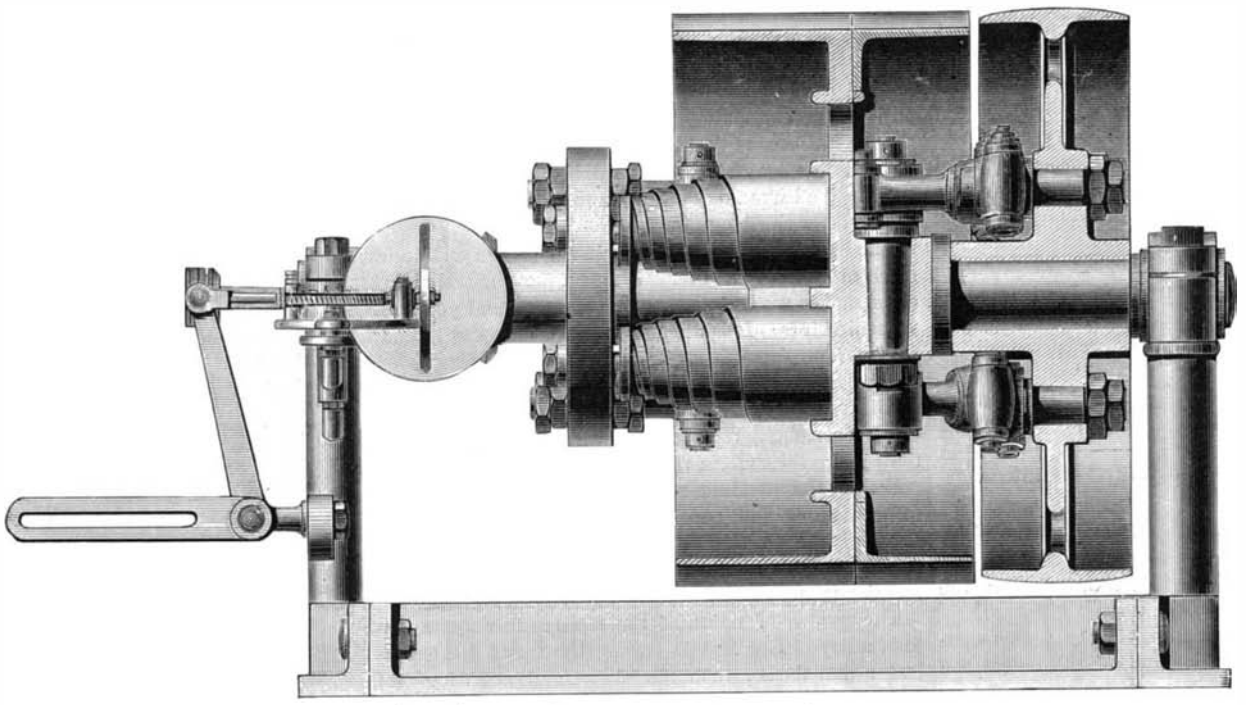


Fig. 1.—BOURRY'S DYNAMOMETRIC GOVERNOR.

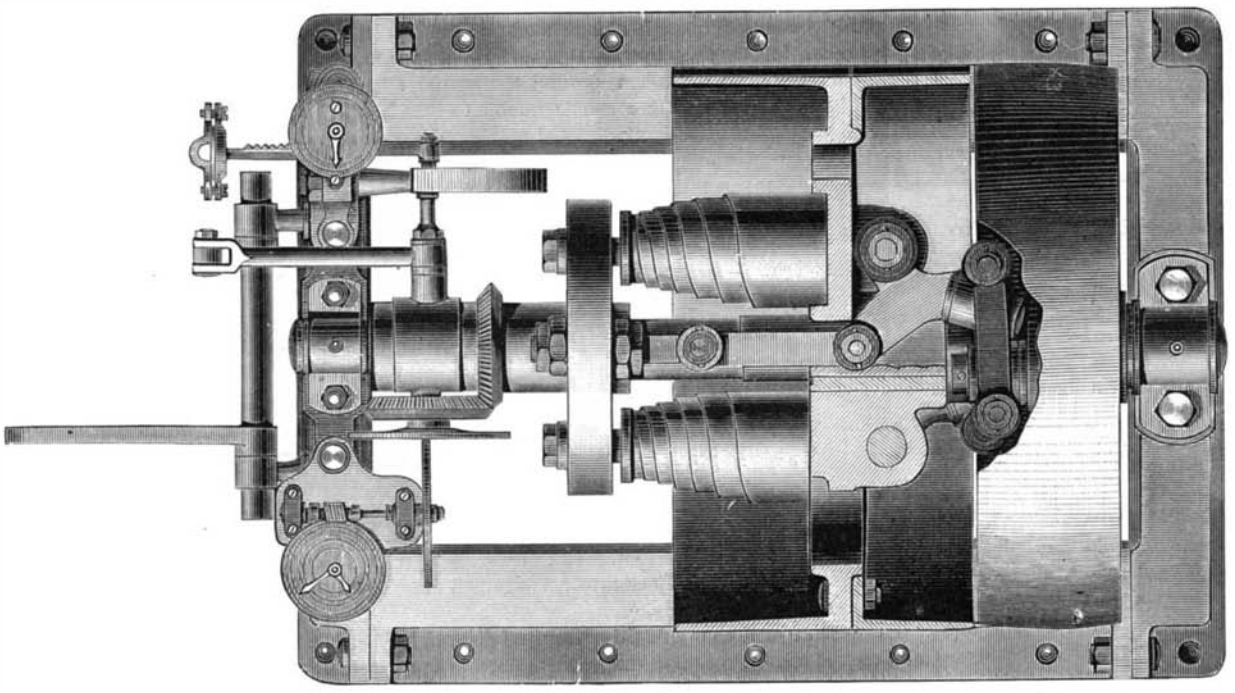
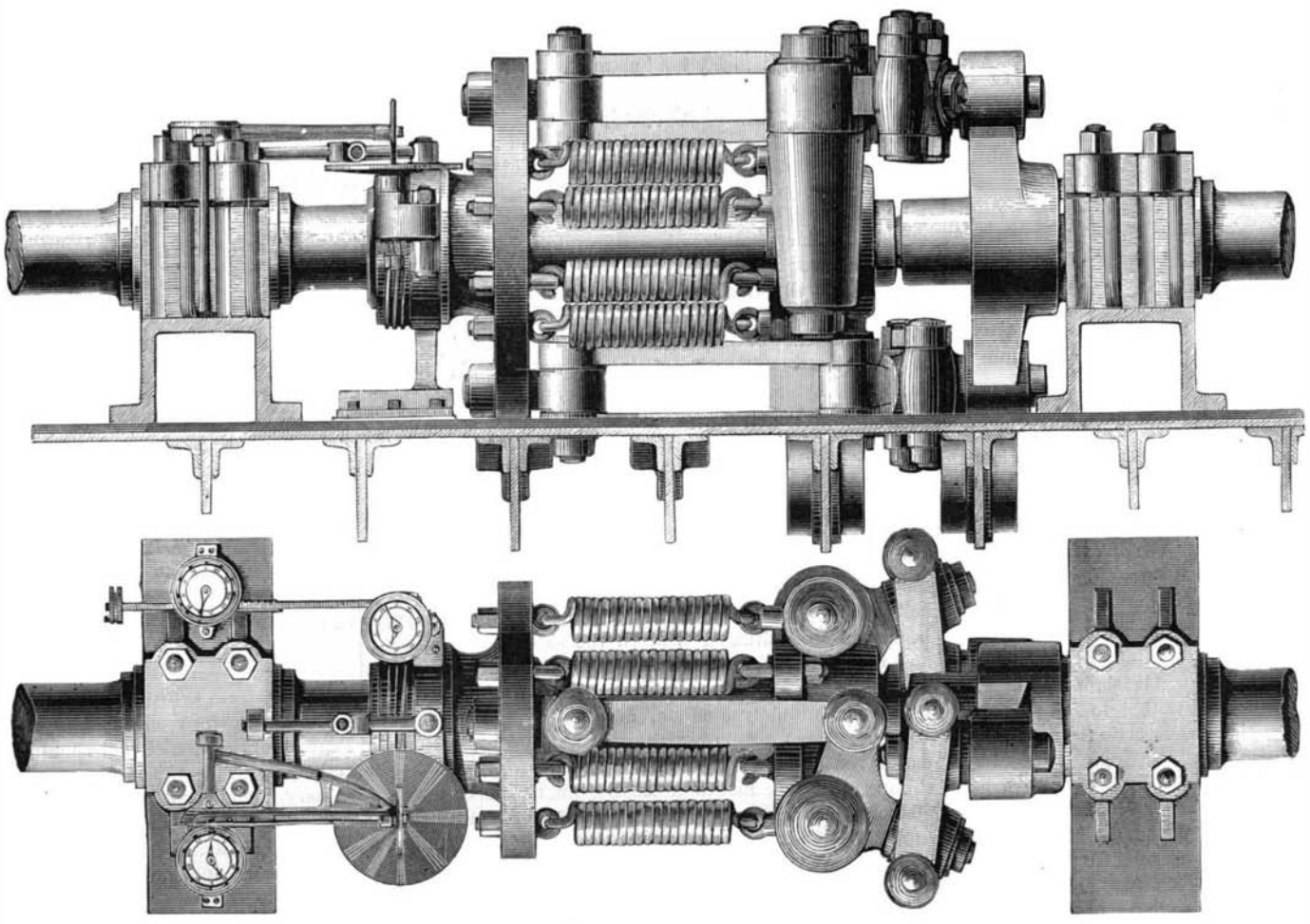


Fig. 2.—PLAN VIEW OF BOURRY'S DYNAMOMETRIC GOVERNOR.



Figs. 3 and 4.—BOURRY'S DYNAMOMETRIC GOVERNOR BETWEEN DRIVING AND DRIVEN SHAFT.

The second arrangement, shown in elevation and plan at Figs. 3 and 4, illustrates the appliance connecting the lay shaft with that of the engine, as in the case of screw steamers. In both arrangements the special parts perform identically the same functions. The journals of a double crank, of a wheel, or of a pulley, made fast on the driving shaft by means of an articulation, act respectively on one of the arms of two bent levers, which oscillate on strong tenons, belonging to a coupling keyed on the lay shaft. The other arm of these bent levers is connected by rods with a slider working freely on the shaft. Between the slider and the coupling are arranged a sufficient number of springs, having together the necessary resistance, and acting according to circumstances, by tension or by compression. When the engine is put in motion, the effect of the rotation first acts on one side of the bent levers, and is afterward transmitted to the slider and the springs. These latter, becoming compressed or extended at each change of resistance, give a reciprocating movement to the slider, the position of which always corresponds exactly with the load on the engine. In order to transmit this movement to the steam valves, the sleeve is provided with a collar which participates in its reciprocating, but not in its rotary movement. This governor, receiving the whole power given out by the engine, acts as a constant dynamometer, to which may be fitted the various measuring instruments, the motions of which are derived from that of the collar on the slider.

The first of these instruments, the dynamometer proper, serves to measure the resistance opposed to the engine; it consists of a graduated dial, on which works an index, receiving its motion from a rack

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actuating a small pinion. The second is a counter, revolving with greater or less speed according to the resistance to be overcome by the engine, which resistance it records in kilogrammeters or foot pounds, thus constituting a dynamometric indicator, analogous to gas and water meters. A third instrument, the "dynamograph," represents graphically, on an endless band of paper, the variations of the resistance. The first two instruments are easily distinguished in the illustrations. As regards the third, the place of the pencil only is shown at the end of the rack of the dynamometric index, the arrangement of the band of paper varying with the circumstances of each particular case. An ordinary counter is shown in the last two figures.

In order that this appliance may work with precision as governor, its action must be regulated so as to correspond exactly with that of the steam valves of the engine; that is to say, their opening must coincide with the respective positions of the slider, which may be obtained empirically, or better still, by calculation. It is not necessary that all these instruments should work constantly. Thus, in stationary engines, the dynamograph will only be used periodically in the same way as an indicator. On the other hand, for screw engines, there is every reason to cause the work of the engine and the resistance of the propellor to be traced continuously during the whole voyage, so as to retain a true record of the state of the sea. It is always useful for the dynamometric counter to work continuously, whatever be the nature of the motor to which it is applied; it will indicate the total power given out from any given instant, and will permit of comparing the effective force developed with the quantity of fuel consumed. For the determination and checking of the amount of motive power let on hire, this instrument is almost indispensable. The dynamometric index, which gives a constant indication of the resistance, and consequently the strain on the motor, is an excellent guide for the engine man and stoker, enabling them to judge of the quantity of water and fuel required. This index, indeed, records the measure of the work done in any establishment, while an exact reproduction of it in the office, by electrical or mechanical means, constitutes a valuable method of supervision which cannot fail to exert a favorable influence on the production.

New Factory of the Edison Electric Lamp Company.

The moving of the lamp factory from Menlo Park to East Newark, N. J., affords a fitting occasion for making a brief mention of the history of the Edison Lamp Company.

The manufacture of lamps was commenced at Menlo Park, in November, 1880. Prior to that date a large number of lamps had been made, but the first regular pay roll of the Lamp Company, as an organization distinct from the laboratory and experimental department of the Light Company, was November 11, 1880, which may be taken as the date of the starting of the factory. From that time until April 1, 1882, when moving to Newark was commenced, the factory was running all the time, except about six weeks. The largest number of men employed at any one time was 135, and for the last year there has not been at any time less than 100 hands employed. Up to April 1, 80,000 lamps were shipped, and at that time there were about 50,000 unsold in stock. The reason for moving the factory to East Newark is to secure larger buildings, with increased facilities, also convenient accommodation for workmen, and to be nearer the source of supply for obtaining reliable help. The manufacturing of lamps was begun in the new factory at East Newark on June 1, 1882, and 150 men are now employed. The tools and power now in the factory are adequate for making 1,200 lamps a day, but the factory has an ultimate capacity of 40,000 lamps a day, which will require from 3,000 to 4,000 hands, according to the style of lamps made. The lamp factory has always been managed with unusual skill and intelligence, and all visitors have united in praising the perfection of the system and the economy and precision of the work. The officers of the Edison Light Company are as follows, namely: Thomas A. Edison, president; Francis R. Upton, treasurer; William Holzer, superintendent; and J. J. Bradley, master mechanic.

Photography of Maps, etc.

The difficulty of copying a map or plan by the photographer to whom such work is only brought at rare intervals, is, it is well known, very difficult, the obtaining a perfectly true rectangular image on the ground glass being most wearisome without the aid of special appliances. One plan recommended for the purpose is to suspend a block that is perfectly square by a piece of string against the center of the picture, any departure of the axis of the lens from a true perpendicular to the plan being shown by one or other side of the square coming into view. We recently saw an improvement upon this method, says the *British Journal of Photography*. A pill box with red lining was suspended, by the aid of a piece of cotton, just over the center of the plan, and the slightest deviation was indicated by the red lining forming a sort of ribbon on the ground glass, which showed the exact direction the plan required to be moved to bring it into proper position.

Coal Jigging in the Schuylkill Region.

The *Coal Trade Journal* says that the Mahanoy jig house has proved such a success that another near Heckscherville will go up this summer. They will have a capacity of 200 cars per day of pea, buckwheat, and dust coal. In these houses the coal is agitated in water. Slate being the heaviest part drops to the bottom, and the coal is brought out cleaned of this objectionable part. To pick such small sizes of coal would be a tedious and unprofitable job. Under the new process pea coal will receive better treatment than by screening, and its market value will be enhanced. The company propose to treat the coal dirt at the collieries in this way, relieving it of about 18 per cent. of slate. The coal will be used in those engines of the company which are specially adapted to such fuel. The amount of dirt prepared in this way last year at a cost of 5 cents per ton, and in which there remained only 4 per cent of slate, was 60 000 tons, thus saving to the company over $120,000. When the new buildings and machinery made for treating the dirt are completed all stationary engines at the collieries and in the shops and foundries of the company will be supplied with it, and the marketable sizes of coal now used by the company will be sold to the trade.

PHOTO BASS-RELIEFS.

BASS-RELIEFS BY PHOTOGRAPHY.

Among the interesting industries to which electricity may be applied, is the metallic reproduction of photographs in relief. Some curious specimens were exhibited at the Paris Exposition of Electricity, and our engraving represents six small bass-reliefs in metal obtained from simple photographs.

The process employed by the inventor is one of great simplicity, and differs only from those already known by employing gelatine in liquid form, instead of dry or in paste. An ordinary photographic negative is taken and placed in a printing frame. A rubber tube is put behind the negative, and bent around the edge, and over this a second glass is placed; the frame is then closed as in ordinary printing. The space between the two glasses is rendered tight by the rubber tube, and in this space, opened only on one side, a solution of bichromated gelatine is poured; then the apparatus thus prepared is exposed to an electric light of sufficient intensity. That which was employed at the Exposition was supplied by a small Siemens machine, consuming about three-horse power. A reflector conveniently arranged would certainly have given more complete and rapid results by concentrating a greater number of luminous rays upon the subject experimented upon. When the light has worked upon it sufficiently, the gelatine coagulates in layers or coatings of variable thickness, proportionate to the quantity of light which passes through the negative. The thickness is but little more than two millimeters, and thus a hollow reproduction of the photographic design is made. This hollow gelatine mould having been hardened in a suitable bath, an impression is taken by electrotypy, which will be in bass-relief.

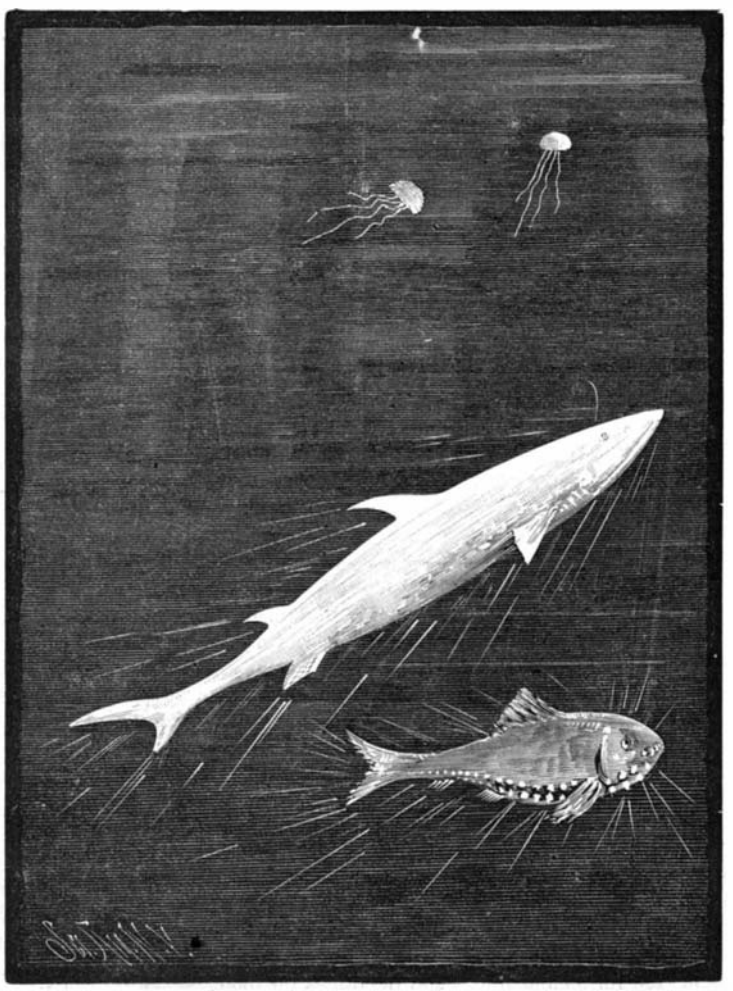
These reliefs may be made much more pronounced by giving to the gelatine mould a slight curvature.

Artistic productions may be obtained by this process at very low prices.—*La Lumière Electrique.*

A LUMINOUS SHARK.

BY C. F. HOLDER.

Among the later outgrowths of scientific investigation we find the theory of abyssal light, intended to explain the presence of eyes in many of the deep sea forms, their existence supposed to be conditional upon the presence of light in the greater depths of the ocean. The Ascidians and Alcyonarians are well known as wondrous light givers. The form of the former we are most familiar with is the oval ball that seems growing upon a stem, and waves to and fro with the tide like a veritable plant; it is, however, a highly organized animal. Some of the Ascidians are free swimmers, and live in colonies; such is the Pyrosoma, one of the most remarkable of all phosphorescent creatures, as well as one of the largest. In appearance they resemble an elongated empty barrel, about five feet long as a maximum, with one end closed, the other open, a provision that insures movement in a given direction. The means of propulsion seems incomprehensible, but it is easily explained, however, upon an examination of the animal. Each individual in the colony draws in water from the outside and ejects it into the interior, where it finds a common outlet at the open end, the current rushing out forcing the aggregation of Ascidians along in the direction it happens to take. The surface is completely covered with curious filaments that appear to wave to and fro. Such is the general appearance of the creature in the day time, but in the night or abyssmal depths of the ocean it presents an entirely different sight, gleaming and glowing with a wondrous golden light, that penetrates the water for twenty or thirty feet around it, and resembling more than anything else a cylinder at white heat, vibrating waves seeming to pass over it in quick succession, producing many different tints of yellow and gold. As may be surmised, at a distance of one hundred feet or more they resemble worms three or four feet in diameter, of wavy, nebulous matter, the center burning brightly. The appearance of numbers of these wondrous creatures in the water is an extraordinary sight, and looking down into the depths we seem to be looking into space. Every break of the water is the signal for myriads of beautiful creatures to spring into life, as it were, the sea fairly igniting, the minute granules in the depths below sparkling and scintillating in the reflection. Great constellations seem revolving in erratic courses, now rising and falling, meeting each other, the lights intermingling, while smaller phosphorescent jelly fishes, like stars of lesser magnitude, revolve about them, completing the curious scene. The light given out by the Pyrosoma is not confined to the water, but is reflected above it, covering everything with a pale, ghostly light. The sails of vessels are lighted up by it, and cast dark shadows about, while within four or five feet of the animal a newspaper can be read with perfect ease.



LUMINOUS SHARK (*Squalus fulgens*).—FISH WITH PHOSPHORESCENT SPOTS (*Ichthyococcus ornatus*).

But the most curious light-giving forms discovered are the fishes. Among the bony fishes of great depths, the families Scopelids, Sternoptychids, and Stomiatids, have long attracted attention, on account of the rows of bright spots that occur upon their sides, now found to be luminous.

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These are found especially upon the fishes *Chauliodus sloani*, *Stomias boa*, *Scopelus humboldti*, etc. In the *Ichthyococcus ornatus* and *Scopelus rafinesquii*, they are specially abundant. In one species of the former a large luminous spot occurs upon the front of the head.

The distinguished naturalist of the Challenger expedition, Willemoes-Suhm, now deceased, saw Scopelius phosphorescent in the night, of which he says: "One of them hung in the net like a shining star as it came out of the darkness. Possibly the seat of the light is in the peculiar side organs, and it may be that this phosphorescence is the only source of light in the great depths of the sea."

The thought that in the dark abysses of the deep sea every animal carries its lantern as the miner carries his lamp on his head, is a very fascinating one; and, indeed, Herr Willemoes-Suhm observed several other fishes that were provided on the smooth head and on the head-beard with a "remarkably large sense organ." Valenciennes has also remarked of the genus *Hemiramphus* that it bears a strongly glittering phosphorescent pustule on the tip of its tail.

Among the fishes discovered by the Challenger expedition was the *Echiotoma microdon*, a dark fish from two miles beneath the surface. Below its eyes were two luminous spots; a narrow elongated one above the maxillary, and a small, short organ nearer the eye.

Another species, the *Micripnus*, had long fringed barbels; luminous spots above the maxillary, small and round. This was found on the Australian coast in 2,150 fathoms.

A stomatoid fish, Bathyophis, found over three miles below the surface, had long barbels; small luminous organs above the middle of the upper jaw, and a number of others along each side of the abdomen; also on the tail and outer ventral rays.

In the Ipnops the body was long, covered with cylindrical scales, and devoid of luminous organs. The head was depressed, long, and spatulate, its entire upper surface occupied by a remarkable phosphorescent organ that was longitudinally divided into two symmetrical halves.

The most remarkable light-giving fish, however, is a shark, a species of *Scymnus*, and allied to our morse of the southern coast, discovered by Dr. Bennett in Australian waters. The light in this case was universal. In relation to his find, Dr. Bennett says: "When the larger specimen, taken at night, was removed into a dark apartment, it afforded a very extraordinary spectacle. The entire inferior surface of the body and head emitted a vivid and greenish phosphorescent gleam, imparting to the creature, by its own light, a truly ghastly and terrific appearance. The luminous effect was constant, and not perceptibly increased by agitation or friction. I thought at one time it shone brighter when the fish struggled, but I was not satisfied that such was the fact. When the shark expired (which was not until it had been out of the water more than three hours) the luminous appearance faded entirely from the abdomen, and more gradually from other parts, lingering the longest around the jaws and on the fins.

"The only part of the under surface of the animal which was free from luminosity was the black collar around the throat; and while the inferior surface of the pectoral, anal, and caudal fins shone with splendor, the superior surface (including the upper lobe of the tail fin) was in darkness, as, also were the dorsal fins, back, and summit of the head.

"I am inclined to believe that the luminous power of this shark resides in a peculiar secretion from the skin. It was my first impression that the fish had accidentally contracted some phosphorescent matter from the sea, or from the net in which it was captured, but the most rigid investigation did not confirm this suspicion, while the uniformity with which the luminous gleam occupied certain portions of the body and fins, its performance during life, and decline and cessation upon the approach and occurrence of death, did not leave a doubt in my mind that it was a vital principle, essential to the economy of the animal. The small size of the fins would appear to denote that this fish is not active in swimming; and, since it is highly predaceous, and evidently of nocturnal habits, we may perhaps indulge in the hypothesis that the phosphorescent power it possesses is of use to attract its prey, upon the same principle as the Polynesian Islanders and others employ torches in night fishing."

Phantom Lights at Sea.

A Fulton Market fish dealer gives the following explanation of some of the strange lights, phantom vessels, and other mysterious appearances that puzzle seamen:

"Two years ago I went menhaden fishing, and one day as we were going up the Sound one of the hands said he hoped we were not going off the Point, meaning Montauk. I asked him why. He seemed kind of offish, but at last let out that he had seen ships sailing about in the dead of night in a dead calm. I laughed at him, but two nights later we came to anchor at Gardiner's Bay, and as it was a hot night we stretched out on deck. In the middle of the night I was awakened by some one giving me a tremendous jerk, and when I found myself on my feet my mate, shaking like a leaf, was pointing over the rail. I looked, and, sure enough, there was a big schooner about an eighth of a mile away, bearing down on us. There wasn't a breath of wind in the bay, but on she came at a ten-knot rate, headed right for us. 'Sing out to the skipper,' I said. 'It's no use,' said my mate, hanging on to me, 'It's no vessel.' But there she was, within a hundred yards of us. Shaking him off, I swung into the rigging, and yelled 'Schooner ahoy!' and shouted to her to bear away, but in a second the white sails were right aboard of us. I yelled to the hands, and made ready to jump, when, like a flash, she disappeared, and the skipper came on deck with all hands and wanted to know if we had the jimjams. I'd have sworn that I had seen the Flying Dutchman but for one thing. We saw the same thing about a week afterward. The light passed around us and went up the bay. I got out the men and seine and followed in the path of the phantom schooner, and as sure as you are alive, we made the biggest single haul of menhaden on record. The light, to my mind, was nothing more or less than the phosphorescence that hovered over the big shoal. The oil from so many millions of fish moving along was enough to produce a light; but you will find men all along the shores of Long Island that believe there is a regular phantom craft that comes in on and off—sort of a coaster in the spirit trade. I saw an account of something like this in the Portland papers some time after, and they thought it was very remarkable; but wherever you find menhaden you may look out for queer lights on the water—phantom ships and the like."

French Enterprise on the Congo.

The *World's* correspondent at Paris says, in a letter dated June 23, that the French Geographical Society were making a social lion of the French explorer who claims to have stolen a march on Stanley and his Belgian company in Africa. Stanley had found that the Congo was the great waterway of Africa, though unfortunately, owing to the cataracts near its *embouchure*, it was not directly accessible from the coast. It became navigable only at Stanley Pool; but once there traders on the broad river could reach one of the richest regions in the world. How to get to Stanley Pool? Stanley could think of no better way than to cut a road of about 280 kilometers from the coast, parallel with the cataracts. M. Savergnan de Brazza, the Frenchman in question, thought of a much better way. It occurred to him that from the French station at Gaboon he might find some affluent of the Congo floating directly into the pool. He did find such a river, the Alima, which is separated from the Ogoone only by 80 kilometers of land, and the Ogoone is in direct communication with the French possession. It was a question, therefore, of a land journey of 80 kilometers, as against a land journey of 240, or a saving of two-thirds. He said nothing, but stole quietly back to France, obtained the necessary funds from his government, went back again and reached Stanley Pool by the short cut in time to welcome Stanley on his arrival. He had taken possession of it in the name of France, made treaties with the natives, and dealt out French tricolors to them for the decoration of their persons and property as lavishly as if they had been mere orders of the Legion of Honor.

The Siemens Steel Patents.

By order of the United States Circuit Court, in the suit of the Iron City National Bank of Pittsburg, Pa., against the Siemens-Anderson Steel Company, the interest of the company in the patents of Dr. Charles W. Siemens was sold at auction by the U. S. Marshal, July 6.

The patents are valued at $500,000. They cover the celebrated Siemens patent revolving furnace, gas furnaces, and various processes and methods of making cast steel, together with numerous improvements. Although the sale had been duly advertised, there was only one bidder, and the property was sold to the attorney for the prosecutor for $1. The reason is, that under the laws of Pennsylvania, and a recent decision in the Allegheny County Court, a patent cannot be seized for debt, and nobody thought it worth while to bid. The bank, however, has taken the precaution to go through the form; and if the decision of the lower court is reversed and the sale declared legal, it will find itself in possession of the sole right to the use of the patents in the United States.

Alcohol from Acorns.

It is said that alcohol equal to that made from grain can be produced from acorns. The acorns are freed from the shell and ground finely; then they are mashed with malt, and allowed to ferment. Acorns contain about 20 per cent of starch, and eighteen per cent of gluten. They would be a valuable article for human food if it were not for the tannic acid (about 3 per cent) which they contain. Vast quantities which go to waste every year, where hogs are not fed in the woods, might be gathered by boys, and converted into alcohol for use in the arts, thus freeing an equivalent amount of grain for use as food. Or some young student of practical chemistry might make a good thing for himself and for the world by devising an economical process of separating the starch, gluten, and tannic acid, the last for technical uses and the others for food.

Berlin Amber.

Recent discoveries of amber in and near Berlin have been so promisingly large that predictions are made that the region will yet become a competitor of the amber fishing stations along the shores of the Baltic. Near what is called the port, a large deposit has been found, and in the Genthinerstrasse during a single week more than a hundred good-sized pieces were dug up. In the Landgrafer-strasse, in ancient alluvial soil, about twelve feet down, a systematic bed of amber was found. Not far from the city another discovery has also been made. Berlin is known to be built on sand, and considerable surprise is expressed that amber should turn up in it, and especially that its presence should have remained unknown until this late day.

George W. Hawes.

George W. Hawes, Ph.D., Curator of the National Museum of Washington, died at Colorado Springs, June 23, in the thirty-third year of his age. Dr. Hawes was born in Marion, Ind., of New England parentage, and was educated at Yale College, also studying abroad, and receiving the degree of Ph.D. from the University of Bonn. He devoted himself with zeal and success to that department of geology known as lithology, making original microscopic investigations and publishing many papers in scientific journals. He was engaged on the geological survey of New Hampshire, and was Professor in the Sheffield Scientific School at New Haven. In February, 1881, he was appointed Curator of the National Museum, where he gathered an extensive collection of all the building stones in the United States.

William S. Vaux.

William S. Vaux, a well-known amateur mineralogist, died at Philadelphia on May 5, in his 71st year. As vice-president of the Academy of Natural Sciences, and of the Numismatic and Antiquarian Society, as president of the Zoological Society, and as treasurer of the American Association for the Advancement of Science, he showed an active interest in the progress of science.

The chief object to which he devoted his ample means was the collection of choice minerals, and as a result of extensive traveling and constant collecting throughout a lifetime, he left one of the finest collections in this country. His cabinet was remarkable for the beauty of the individual specimens, in many cases unsurpassed. He has bequeathed it to the Academy of Natural Sciences of Philadelphia.

Pre-Indian Relics from Virginia.

Mr. M. S. Valentine, of Richmond, Va., has sent to the Anthropological Institute of London, for exhibition, a collection of very curious articles fashioned in soapstone and clay, which were found lately between the ranges of the Blue and Alleghany Mountains, near Mount Pisgah, North Carolina. The objects are said to be of a type absolutely unique, consisting partly of human, partly of animal figures, either in the round or in various degrees of relief. Some are household utensils. They appear to have been sculptured by metal instruments, so perfect is their workmanship. The human type is alike in the various objects, but is not Indian All are fully clothed in tight-fitting garments. Some are seated in arm-chairs, others on all sorts of animals—bears, prairie dogs, birds, and other shapes belonging to North America. But some also represent types of the Old World, such as the two-humped camel, rhinoceros, hippopotamus Some of the specimens were obviously made since the advent of the whites, and these are fresher-looking and of ruder workmanship. The inference hazarded is that the articles were made by an earlier and more civilized race, subjugated and partially destroyed by the Indians found in Virginia on the arrival of white men.

Recovery from Hydrophobia.

A case of recovery from an attack of hydrophobia was related to the Académie de Médecine at the meeting of June 13, by M. G. Denis-Dumont, of Caen. The details of this case are given more fully in the letter of our Paris correspondent this week. The patient was a man, thirty-eight years of age, of strong constitution, and previous good health, who was bitten on April 16 on the forearm by a rabid dog, which had bitten the same day a woman and two children. The woman died of hydrophobia on May 20, and the news of the death profoundly impressed the patient, who became restless, anxious, affected with extraordinary thirst, and complained of sore throat and of difficulty in swallowing. He refused all drink which was offered him, manifested a tendency to bite persons and objects around him, and presented convulsive attacks of the character so frequently met with in hydrophobia. He was taken to the hospital on May 23, and none of the medical men in attendance had any doubt that he was suffering from hydrophobia. The treatment employed consisted in hypodermic injections of a centigramme of pilocarpine, which caused an abundant diaphoresis and salivation. At the same time a draught was given of two drachms of bromide of potassium, four drachms of chloral hydrate, and an ounce of sirup of codeia (whether at a single dose or in divided doses the report does not state). The symptoms presented a rapid amelioration, and on the 30th of May had entirely ceased. It seems open to question whether or not the case was one of genuine hydrophobia. When the symptoms commence with mental disturbance, distinctly excited by such intense apprehension of the disease as is excited by the news of the death of another person bitten at the same time, the case cannot be regarded as affording conclusive evidence on the therapeutical question. M. Bouley, however, announced his intention of communicating to the Académie at the next meeting another case of hydrophobia in which recovery followed the use of pilocarpine.—*Lancet.*

To render thick paper quite translucent, saturate it (while warm) with Canada balsam or castor oil.

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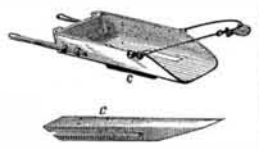
RECENT INVENTIONS.

Improved Button.

Mr. William H. Ward, of Topeka, Kan., has patented an improved button, shown in the accompanying engraving. This button consists of a fastening made of a strip of thin flexible metal having angular slots cut in one end and rolled into cylindrical shape, an eyelet in which the fastening is secured, and a back. The back has a central perforation through which the eyelet and clasp are passed and secured by spreading their inner ends. The face of the button is secured to the back in the usual manner, and is constructed with a depression which fits into the end of the eyelet and fastening, and assists in forming a firm and compact button. The eyelet forming the stem of the button is made so as to allow the face of the button to rotate. Mr. Ward has also recently patented improved pliers for attaching the buttons to garments.

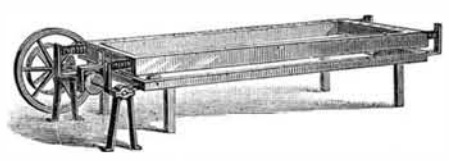
Earth Scraper.

We give an engraving of a novel earth scraper which combines maximum lightness, strength, and economy of construction. The body of the scraper is made of one piece of sheet metal, which is cut out in the flat, by suitable dies, and afterward bent into proper shape, and the joints are locked together by hooked shaped flanges, one edge being turned outward and one inward, and the two are then engaged, and rolled or otherwise flattened, forming a firm lock joint. The handles are attached to the scraper body by open rings riveted to the sides of the scraper in which they are clamped. Two metal shoes, *c*, are applied detachably to the bottom of the scraper. The shoes are tapered toward their rear ends, and have side grooves. Wings are formed by slitting the bottom of the scaper lengthwise and crosswise, and bending the portions thus outlined downward at an acute angle. The shoes are attached by inserting their rear ends between the edges thus formed, and are then forced back until they come in contact with the ends of the grooves.



Separator for Starch.

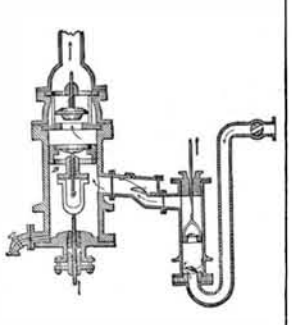
A device for separating starch from the other portions of ground corn has been patented by Messrs. William T. Booth and Alexander H. Bell, of New York city. The supporting frame has longitudinal side rails on which friction rollers are sustained in bearings. Above this frame is a frame which carries a sieve, and is guided and supported by irons on its under side, that slide upon the friction rollers. The frames are so inclined as to insure forward movement of the material upon the screens. At the upper



end of the supporting frame is a shaft, a balance wheel, and an eccentric driven by a pulley. On the screen frame is fixed a yoke that extends over the eccentric, and at the upper and lower ends of the screen are spiral springs attached to each end of the frame, to cause the arms of the yoke at all times to be in contact with the eccentric. The ground material fed to the upper end of the screen is agitated and moved forward by the motion, and the fine particles of the starch fall through the meshes of the sieve, and the refuse passes off at the lower end.

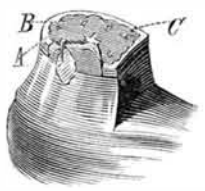
A New Feed Pump for Steam Boilers.

An improved pump for supplying steam boilers with hot water at at higher temperature and with a greater uniformity of pressure than is practicable with feed pumps of ordinary construction, has been patented by John Houpt, of Springtown, Pa., and is shown in the accompanying cut. A vertical pump cylinder is provided with a piston, B, reciprocated by a piston rod attached to a crank shaft. The piston is annular in form, and a relief valve is seated downward therein, and is guided in its vertical movement by a pendent stem. In the upper part of the cylinder is located the discharge valve, which seats downward, and has a vertical guide stem, around which is a spiral spring, that operates to press down the valve when the piston reaches the limit of its upward stroke. A hot water supply pipe having a check valve is located between the feed pump (above described) and a feed water heater or other source of supply. Between such heater and the check valve is placed an auxiliary force pump, whose cylinder is a continuation of the connecting tube. Its piston is reciprocated, simultaneously with the piston, B, and in the same direction, and at the bottom of the cylinder is a check valve.



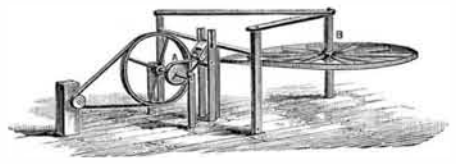
Heel Plate for Boots and Shoes.

We give herewith an engraving of an improved heel plate for boots and shoes, patented by Mr. Edward C. Gardner, of Abington, Mass. The metal part of the heel plate is made with a flange around its circumference and is depressed at the middle. The flange has a smooth wearing surface, and the depressed part has ornamental projections formed on its surface to keep leather filling in place. The filling has its edges shaped to correspond with the shape of the inner side of the flange, and holes formed through it correspond with the studs and holes for nails.



A Novel Horse Power.

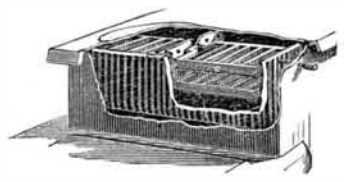
Among recent inventions we find an improved horse power for driving cotton ginning and other similar machines, that is simple, durable, and cheaply constructed, and has less friction than machines for this purpose now in use. The device is shown in the annexed engraving, in which A is a horizontal shaft journaled in two posts, and B is a vertical king post to which the main power wheel is secured, and it is revolved by horses attached to a lever secured to the post below the power wheel. Upon the shaft, A, are fixed two



pulleys, one larger than the other, and it receives its motion from the main power wheel attached to the post, B, by a belt *a*, that passes over the small pulley and communicates it to the ginning or thrashing machine, by means of a belt passing over the larger pulley and a small pulley on the machine. The belt is guided from the power wheel to and over the small pulley on the shaft, A, by one horizontal and two vertical rollers, over and between which it passes, and the belt is kept tightened by a swinging belt tightener, which is provided where it comes in contact with the belt with a roller. The above device has been patented by Mr. Thomas A. Brewer, of Oliver, Ga.

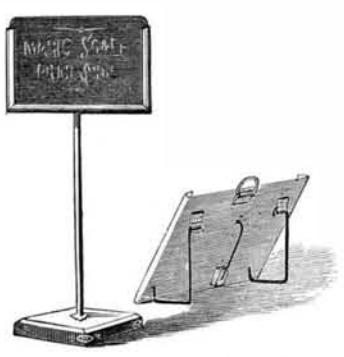
An Improved Stove Grate.

Mr. George M. Brill, of New Baltimore, N. Y., has lately patented an improvement in stove grates, the object of which is to allow a small fire to be used in a stove when a large one is not required, and also to allow the fire to be brought close to the top of the stove, when desired The stove grate is made in two parts, and is connected only by a rigid pivot which is of sufficient length to allow the grate to receive a division plate for confining the fire to one part of the fire box. This division plate has a number of holes through it for the passage of air to keep it from being unduly heated. Upon the outer ends of the grate are formed pivots which work in bearings in the end plates of the fire box, one of which is extended and squared to receive a wrench for shaking or dumping. When the division plate is inserted a fire can be built upon either half of the grate. In case it is required to have a fire near to the top of the stove, an auxiliary grate can be used, the pivots of which work in bearings in the upper part of the fire box. The improvement is shown in the accompanying cut.



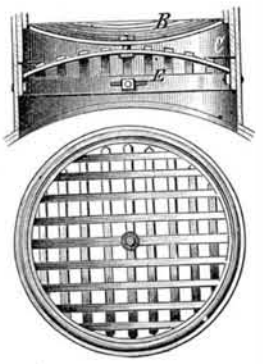
Show Card Holder.

A novel device for holding price and show cards has recently been patented by Mr. Will. C. Rood, of Quincy, Ill., and is shown in the accompanying engraving. A frame is provided on its front side, at its lower edge and ends, with grooved flanges, behind which a sign or show card may be passed and retained. At the rear side, near its bottom edge, the frame has a socket for receiving the upper end of a standard, the lower end of which fits in an aperture in the top of a base. At the upper edge of the rear side, a ring is attached, by which the frame may be suspended from a nail. The frame is also provided with rectangular hooks, that swing in loops attached to its rear surface, by which it can be held in an inclined position, or if desired the hooks may be turned up and used for suspending the frame. A pin is attached to the back of the frame near its middle which projects downward, and by which the frame, may be secured to articles to be marked.



Spark Arrester.

An efficient and durable spark arrester, that is easily attached to and detached from the smokestack of a locomotive, has recently been patented by Mr. John L. Kantner, of South Easton, Pa., and is shown in the accompanying engraving.



Inside of the smokestack is placed a concavo-convex grate, formed of parallel bars attached at their ends to a rim. This grate fits into the upper part of an outer rim, C, and has guide pins which enter vertical slots in the rim. The rim, C, is fitted into the smokestack, and rests against the rim of the lower grate, E. This grate is also concavo convex shape, and is formed of parallel bars attached to a rim formed with slots, to receive bolts that secure it to the stack. The alternate bars of the grate terminate at a distance of half an inch from the rim. The grates are placed with their convex sides toward each other, and are secured to each other at their centers by a bolt. With this construction, the incandescent pieces that are carried up the smoke stack will be broken, by striking against the grate bars, into such small pieces as to be rendered incapable of doing damage; those not broken falling back into the chamber, to be again thrown up until they are broken.

Parasites of the Fly.

A microscopical discovery, which may prove highly important in a sanitary point of view, has been made by Thomas Taylor, M.D., microscopist of the Department of Agriculture. About a year ago, while dissecting out the proboscis of a common house-fly, Dr. Taylor discovered minute snake like animals moving quickly from the proboscis. Continuing his experiments from time to time since then, he found that house flies are very frequently inhabited by these animals. He has found them generally in the proboscis of the fly, although sometimes they are found in the abdomen, and he thinks that since flies are carriers of these minute snake-like animals, they may in like manner be conveyers of contagious germs, much smaller bodies. These animals measure about eight one-hundredths to one-tenth of an inch in length, and about two one-thousandths of an inch in diameter. They are classed under the *Nematoidæ*, genus *Anguillula*. They are much larger than trichinæ or so called vinegar eels. Mr. Taylor has found as many as seven of these animals in the proboscis of one fly, and three more in the abdomen, ten in all. Sometimes none are discovered, sometimes one only, but frequently four are seen. Their presence is usually indicated by a rolling movement in the anterior portion of the proboscis. When this is observed, if a drop of water be placed upon it, the animals will readily leave the proboscis and take to the water. They are frequently observed passing in and out of the proboscis, to and from the water, as if the proboscis was their natural home. A power of 25 diameters is sufficient to observe their general movements, but for examinations of their structure from 250 to 500 diameters is necessary. They are perceptible to the naked eye in certain light. Mr. Taylor proposes to make the experiment of feeding flies on trichinosed meat to test the possibility of trichinæ or the eggs of trichinæ being taken up by flies.

A Lecture on Capsicum.

A curious scene occurred a few weeks ago at the lecture room of a well known school of pharmacy, says the *Monthly Magazine*. The room was pretty well filled, and the lecture was on *capsicum* and other stimulants.

"Capsicum," said the professor, "is well known to you all; you have, no doubt, often gathered it in your botanical excursions with my learned colleague who occupies the chair of botany in this institution. You all know that when the pods are properly dried and reduced to powder, they produce our ordinary cayenne pepper. They also yield a tincture which is often used as an adjunct to medicines when it is desirable to stimulate the mucous membrane of the digestive organs. Cayenne pepper itself has been used with some effect in the treatment of delirium tremens, and a moderate dose of it given on going to bed has been known to cut short a violent attack of cold or ague. The active ingredient of the capsicum pods, as before observed, is soluble in alcohol; little is yet known about it. . . ."

The lecturer had got to this point of his discourse when it was suddenly interrupted. One of the laboratory students was desirous of seeing the active principle contained in the tincture, and had been for some minutes evaporating a little of it over a spirit lamp. The fumes of the alcohol carried up into the air of the lecture room a notable quantity of *capsicine*, and everybody began to sneeze most violently, including the professor. In about two minutes it was quite impossible to stay in the room, and the place was rapidly evacuated by about forty pharmaceutical students amid a perfect volley of sneezing and laughter. The professor who had just observed that with regard to capsicine "little was known about it," was made more intimately acquainted with it at that moment than he desired!

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ENGINEERING INVENTION.

An improved compound beam engine has been patented by Mr. Gideon B. Massey, of New York city. Instead of the cylinders being arranged side by side, as usual, the low pressure cylinder is placed vertical, its rod connecting to the beam of the engine; and the high pressure cylinder horizontal, and connected to the crank on the shaft. The horizontal cylinder passes through the vertical cylinder at its mid length, at one side of its axis, to allow the piston rods to pass each other, and in the sides of the horizontal cylinder are the steam ports to the vertical cylinder. The vertical cylinder being divided, two pistons are secured to the same rod, that work in opposite ends of the cylinder, and the cylinder ends are connected by a pipe that allows the air to pass back and forth as the pistons reciprocate. At the ends of the horizontal cylinder are exhaust and steam ports communicating with the main steam and exhaust openings, and the valves are provided with suitable means for their operation.

MECHANICAL INVENTIONS.

Messrs. Henry H. James and John C. Dunbar, of Bangor, Me., have patented an improvement in sifting grates. The grate bars are provided with projecting prongs on each side, and each bar has a downwardly projecting arm attached to its middle part. The ends of the bars rest in recesses on the upper side of the grate frame. This frame is pivoted at its front and rear in suitable bearings in the stove frame, and it swings on these pivots. The ends of the downwardly projecting arms of the grate are passed through slots in a bar, under the center of the frame, held to the arms by pins, and when the bar is moved lengthwise the grate bars are rocked. The front pivot of the grate frame is surrounded by a cam sleeve which passes into a recess on the front end of the bar under the grate. The outer end of the flange sleeve fits a square opening in a crank, by which it is rotated.

An adjustable scale for weighing light articles has been patented by Mr. Rosendo Torras, of Brunswick, Ga. Two knife edged scale beams are pivoted in the sides of a casing, and the inner end of each beam has a convex rack that engages with a pinion mounted on a shaft journaled in blocks hanging from the top of the casing, and supporting a segmental rack, mounted on and connected with the same shaft. This rack engages with a pinion attached to the pointer of a dial plate on the front of the casing on which the weight is indicated from left to right and from right to left. On the outer end of each of the scale beams are receiving plates, to which are attached weights to keep them in a horizontal position.

A rock drill, that will rapidly bore a straight hole in rock, and will not follow the seams, has been patented by Mr. William H. Silsby, of Orleans Bar, Cal. The drill is provided with a cutting edge at its lowest point, and with offsets in its sides forming cutters, each cutter projecting beyond the one next below it. The parts connecting the cutters are inclined toward the center of the drill. The lowest cutting edge is beveled from the flat sides of the drill, but the offset cutting edges are flat below.

Mr. George D. Speilman, of Cincinnati, O., has recently patented an improved padlock. A jaw which has a recess in its front end is pivoted in the lock case, and its inner end is round and has two recesses. A spiral torsion spring is wound around its pivot and forces it to swing outward. A series of slightly different shaped spring tumblers, all of which have a different shaped projection at the lower end, are pivoted in the casing. The casing has a transverse slot in its rear, and through this the key is passed into the lock. The key has as many projections and recesses in its front end as there are tumblers in the lock. The casing is provided with a rigid jaw which has a stud at its front end that fits into the aperture in the pivoted jaw. When the key is passed into the lock the tumblers all move back and the torsion spring throws the swinging bar back.

MINING INVENTION.

An improved furnace for treating the ores of mercury has been patented by Messrs. Edward G. Hall, of Healdsburg, and Myron D. Haskins, of Guernerville, Cal. In the wall of the furnace, near its bottom, is an arched top fireplace, and above it are two similar chambers. Above these is a cylindrical chamber, having a funnel shaped bottom, communicating by pipes with the middle chambers. In this cylinder are diaphragms that extend nearly across the chamber, and a vertical shaft is journaled in the chamber which has arms projecting nearly to the walls, each arm being placed in the space between the diaphragms. In use the upper chamber is filled with ore and lime, the shaft is rotated, and as the ore becomes partly roasted, it is discharged into one of the middle chambers and becomes separated and broken up so that the mercury is liberated, and is conveyed to the condensing chamber.

ELECTRICAL INVENTION.

A device which provides for conveniently laying underground telegraph wires, and for access to such wires, has been patented by Mr. Warren D. B. Smith, of Boston, Mass. A box is provided which is composed of continuous sides, a top of removable sections, and bottom pieces connecting the side pieces at intervals. At suitable intervals the box is provided on its inside with dovetail flanges which receive wire holders, having diagonal slots to receive and retain the wires Between the holders, at each side, are posts fixed on the bottom cross bars, also slotted to receive wires. It will be seen that the wires are held securely and separated whether the line be straight or upward or downward.

TEXTILE INVENTION.

Mr. Alvin Woodman, of Lewiston, Me., has patented a machine to be used for tentering cloths, making them of uniform width, without distorting the checks or plaids. At the feeding end of the frame is a roller carrying the cloth. The spreader, size box, squeezing rolls, and carrier rolls are of the usual construction, except that the spreader is made adjustable and the spreader bars are fluted diagonally from the center outward. From the rollers to the straightening mechanism at the other end of the machine are two endless chains to carry the cloth. Between the end of the chains and the drying cylinders is fitted a system of adjustable rollers through which the cloth is passed and by which the cloth is delivered to the calendering rollers with the figure correct as designed.

AGRICULTURAL INVENTIONS.

Mr. Jerome L. Bergen, of Flatlands, N. Y., has patented an improved distributer for uniformly distributing fine fertilizers. The frame of the machine consists of two side bars connected by cross bars, and between the forward ends of the side bars is journaled a wheel. On the rear part of the frame is a hopper made open at its bottom, except a narrow strip at the rear side. To the center of this strip is pivoted a distributing apron, that is connected at its edge to the hopper by a strip of flexible material, and in the apron, in front of the hopper, is an opening through which the fertilizer falls. The amount of the fertilizer distributed is regulated by an adjustable valve. The hub of the wheel is connected by gear wheels, lever, and connecting rods to the apron to vibrate it laterally to discharge the fertilizer as the machine advances.

An ingenious and efficient machine for hulling rice has been patented by Mr. Shad B. Denney, of Summit, Miss. In the side bars of the frame of the machine is journaled a cylinder, on the face of which are longitudinal ridges, and to one of its journals is attached a crank. From standards on the side bars of the frame are suspended two parallel plates, made in the form of annular sections. In the inner surfaces of the parallel plates are grooves to receive the edges of steel vibrating plates, so arranged that the upper plate will be nearly vertical and the lower nearly horizontal, and they are held closer or farther from the cylinder as is desired. The rice to be hulled is fed through a hopper and is carried around by the corrugations of the cylinder, and passes beneath the inner edges of the steel plates by which the hulls are torn from the kernels of rice.

An improved fruit picker has been patented by Messrs. James R. and Joseph A. Williamson, of Brunswick, Ga. A basket formed of a series of metal strips is secured to the upper end of an adjustable handle which has at its lower end a detachable knee piece. Shears are pivoted to the upper end of the handle in such a manner that the blades rest on the upper edge of the basket, when they are open, and springs on the outer sides of the basket hold them open. Cords attached to the blades of the shears extend down the handles, and by pulling this cord the shears close and clip the stem of the fruit.

Mr. William W. Winegar, of Chambersburg, Ill., has recently patented an improvement in grain drills, by which trash is prevented from collecting in front of the drill hoes. The frame, axle, and wheels of the grain drill are of the usual construction. To the axle of the drill is attached a cam device to operate a lever attached to the upper end of a holding bar that drops by its own weight and holds the trash that may collect in front of the adjacent drill hoes until the drill passes it, when the bar will be raised by the cam and carried forward so that it may again drop in front of the drill hoes. Any desired number of holding bars may be used.

An economical and effective cotton press has been patented by Mr. M. M. Scherer, of Batesville, Ark. The lint room contains a vertically sliding table, turned by a crank attached to its axis, and raised or lowered by ropes passing over pulleys, and wound upon a windlass. When the table is at its lowest limit it forms the top of the space in which the follower moves. The cotton is received from the gin into the lint room, and when a sufficient amount of cotton is in the room, the table is raised and revolved half a revolution, and the cotton is thrown beneath into the space before the horizontal follower, by which it is pressed into a bale in the baling chamber. The horizontal follower is moved with great power by a series of levers and rods which are operated by ropes and a windlass at the opposite end from the gin. Mr. R. H. Brown, of Marion, Va., may be addressed for further information.

MISCELLANEOUS INVENTIONS.

An improved air vent for vessels from which liquids are to be poured has been patented by Mr. George Janeway, of Junction City, O. The vent is cone shaped, and opens at its smaller end into the vessel containing the liquid. The upper end of the cone is provided with a cover having a central orifice. Near the center of the length of the cone is a circular diaphragm, which is concave downwardly and has a central orifice, on which is placed a ball valve which closes the orifice when the diaphragm is horizontal. When the vessel is tilted to pour out the liquid the ball rolls by gravity on the diaphragm, uncovering its central hole, and allows the air to pass into the vessel. The orifice is always closed by the ball valve except when the vessel is tipped to pour out the liquid.

Mr. Henry R. Cassell, of New York city, has patented an improved method of making metallic panels, by which the best works of art can be reproduced in the shape of panels. The work of art is first photographed and the negative or positive exposed upon a sensitized metal sheet. The sheet is then treated in the usual manner, and the result is an engraved metal sheet, containing the lines of a work of art intended to be reproduced either in relief or intaglio. This metal sheet is then covered with a japan, or other suitable enamel, and after thoroughly drying or hardening it, the surplus of the enamel is removed by grinding, until the raised part of the metal sheet is entirely laid bare, and the enamel is even with the surface of the metal. The enameled sheet is then electroplated, and the whole produces a very striking and beautiful effect, the enamel representing the original engraving upon a surface of gold and silver.

A new game apparatus consisting of swinging a suspended ball to strike pins or other objects set up on a suitable platform, has been patented by Mr. George R. Spear, of Brooklyn, N. Y. Suitable standards are attached to a base, and from the top of these a ball is suspended by a cord. At the bottom of the standard is a platform upon which balls or pins are supported, the platform being spotted for the proper arrangement of the pins or balls. The board holds a series of fixed pins in front of the pins or balls to be struck, between which the suspended ball must be accurately thrown. The inventor combines with the platform and pins a wheel of fortune and a checker board, that may be removed from the board and replaced when desired.

Mr. Edward Wensch, of Vienna, Austria, has patented an improved escapement for watches, etc., and it consists in a balance wheel provided with an eccentric pin and with an eccentric on its arbor, the eccentric being between the prongs of a fork on the upper end of a pivoted anchor provided with two teeth and an arm for checking the escapement wheel at intervals, and locking, releasing, and pushing back a pivoted lever provided with a projection, and operated by a spring or weight, which lever acts on the eccentric pin of the balance wheel.

A bobbin spindle which has less friction in the creel than those in common use, and will at all times maintain a sufficient and uniform tension, has been patented by Mr. James Warrener, of Fall River, Mass. The spindle is tipped at its lower end or bearing with a metallic tip that is perforated at the bottom or small end. The perforation, when the tip is on the spindle, permits the spindle point to protrude slightly, or stand flush with the lower end of the tip. With this construction the friction of the spindle is greatly reduced by reason of the partial metal point, and it is prevented from running too freely in the creel by the contact of the wood of the skewer with the creel socket insuring a tension that will not vary so as to break, stretch, or otherwise injure the roving, or cause it to be unduly twisted.

Mr. George B. Owen, of Winsted, Ct., has patented an improved gong bell that gives a louder and more musical tone than bells of ordinary construction. The base of the gong, secured to a clock case, receives the end of a bent standard, the other end of which is screwed into the center of a circular plate having an inwardly projecting flange around its edge, and on its outer side the end of the gong is fastened. In the flange of the circular plate is screwed a rod that is bent at right angles, with its free end turned against the back of the clock case to cause the case to act as a sounding board.

Mr. Joseph T. Mills, of Brooklyn, N. Y., has patented a cheap and efficient fire escape, consisting of a ladder composed of small chains connected by rounds of iron. A winding drum, to which one end of the ladder is fastened, is journaled in blocks secured upon the roof of the building. The winding drum has a crank and a ratchet and pawl for holding the reel. The reel is released by means of a small chain attached to the pawl and running down the wall of the building in easy reach from the windows.

Messrs. John H. Baldwin, of Port Jefferson, and Charles S. Baldwin, of New York city, have patented an improved vehicle spring by which a carriage body can be set low without impairing the strength and flexibility of the spring. Upon the forward axle is secured a half elliptic spring, in the usual manner. Side springs are hung by loose shackles to the ends of the axle springs, and are rigidly attached to metal cross bars to which the body is bolted. By these means a durable and cheap construction and a low setting body are provided.

We find among recent inventions an improvement in bracelets, patented by Mr. William Link, of Newark, N. J. The main part of the bracelet is formed of two semicircular plates, hinged together and having flanges soldered on the outer edges of the plates. These flanges are made hollow, and triangular in cross section, and when the flange is soldered fast to the plate, the wider portion re-enforces and stiffens the plates, making them strong and durable, and prevent their injury by ordinary usage. By this construction, all the parts of the bracelet can be made very light, and yet strong and durable.

An improved wagon which permits of weighing coal at the point of delivery and in the presence of the purchaser, has lately been patented by Mr. Henry R. Robbins, of Baltimore, Md. The body of the wagon has at its corners heavy braced standards. An iron shell fits into and fills the body of the wagon and rests upon its bottom, and is fastened at its corners to ropes passing over pulleys at the tops of the standards, and thence around pulleys to a windlass provided with differential drums. These drums enable one man to raise the shell, and at the same time give it sufficient inclination to the rear to discharge its contents. With the shell of the wagon is combined weighing scales, so attached to its shell that when it is raised it rests upon the scales.

An improvement in dashboards for sleighs has been recently patented by Mr. Emil Rattey, of New York city. The main frame of the dashboard is rectangular in form, and within it is an inner frame composed of tubes slotted lengthwise to receive the edges of a wire netting provided with a bead of metal soldered to the netting; these beads being within the tubes prevent the netting from being drawn out of the slots. The ends may be also secured in the same manner if desired.

Mr. William H. Brownell, of Brooklyn, N. Y., has patented a receptacle for artists' materials, for safe keeping and convenient use. Internally the body of the box is divided into compartments for receiving brushes, pencils, colors, etc., so that they are kept from rolling, and at the end of the tray is a hinged flap that covers and protects the paint ends of the brushes. At one side of the box is a lug, projecting over the palette, and inside of the cover is a projection that rests upon the palette when the cover is closed, thus holding all the materials in their places. The sketching pad is held in the cover by projections and a spring catch when the box is closed. The pad is held for sketching between the front of the box and the upper edge of the cover, and the cover is held to the pad by rubber bands that connect the box and cover.

A novel holder for attaching spectacles to shades or the rim of a hat or cap, has been patented by Mr. Joseph A. Shone, of Salem, Miss. The invention consists of a clip attached by a thumb screw to the under side of a shade or hat rim, and carrying an adjustable folding bar to the lower end of which the spectacles are attached. When the spectacles are not in use the device may be folded up against the under side of the shade or rim, but when they are to be used the device is unfolded, and they are suspended before the eyes of the wearer.

Mr. Thomas J. Porter, of Fleetwood, England, has patented an improved type-setting device by which the work of the compositor is greatly accelerated. The type are placed in troughs that hold them at such an angle that they will slide freely down to its lower end, and are there retained so that the lowest letter in each trough is in position to be raised by a plunger. The plungers for raising the type are placed on one bar and are caused to act simultaneously by a treadle. The troughs are placed at a little distance apart, and each alternate one terminates at its lower end about an inch and three-quarters higher or lower than the one next to it, so as to enable the compositor to take up the types readily.

An ingenious and novel necktie fastener has been patented by Mr. Parker H. Rew, of Rochester, N. Y. A spring formed of wire is bent to form side loops from which the ends of the wire extend downward diagonally and cross each other, that portion of the spring between the loops being bent upward above the crossing of the ends of the wire to form a loop. The cross ends of the spring pass through a staple projecting from the back of the stiffening plate of the necktie bow. This fastener is easily attached to and detached from the collar button.

A novel mode of exhibiting photographic portraits and other pictures has been patented by Mr. Francis E. Mills, of Pittsburg, Pa. The invention consists in placing the portrait on a black ground a little distance behind a polished plane glass having a transparent center and opaque margins. Farther away in front of this glass is placed an opaque screen having a black center and luminous borders. These parts are so placed that when the light falls obliquely upon the picture, and it is viewed at a point at right angles with its plane, the card on which it is taken will be invisible, leaving the portrait standing, apparently statue-like in the air, while images of the luminous figures will appear around and beyond the portrait.

Mr. Charles Pontez, of Omaha, Neb., has patented a peculiar combination of dry and wet amalgamating devices for separating fine gold from silicious or black sand. The dry gold bearing sand and mercury are passed into a tube, in which they are thoroughly mixed, the sand and gold being thoroughly charged with mercury, after which they are subjected to the action of water and caused to pass with the water over a series of amalgamating plates, thoroughly separating the gold from the sand.

An invention for attaching a lantern to a carriage, or to a belt worn around the waist of a person, has been patented by Mr. Andrew J. Curtis, of Monroe, Me. Two wire arms provided with spiral springs clasp the top of the lantern, and are attached to an upright wire frame, the lower ends of which are bent outward and engage with the guards of the lantern. A vertical holding loop is attached to the upper clasp and held in a vertical position by the spiral springs.

Mr. William A. Baker, of Coloma, Mich., has recently patented an improved yoke for holding the tongue of wagons. The yoke is to be suspended under the horses, from straps attached to the back pad of the harness. It is flattened on its under side, and at its center is pivoted to the under side of the tongue, and is provided with four mortises, two on each side of the pole arranged so as to come on each side of the horse. In these mortises are secured straps that buckle to the straps of the back pads, and in these mortises are also buckled the hold back straps.

Mr. Eleazer Thompson, of Danbury, Ct., has lately patented an improved pedicycle. This invention is of the class of pedicycles that are mounted on two wheels, one of which is larger and in advance of the other, the wheels being connected by the foot support. The upright of the foot support may be strapped against the leg below the knee, and the journal of the main wheel will come in front of the line of weight of the person. In the rear end of the foot support is placed the small wheel, and the forward end of the support is curved downward. By this arrangement the forward or curved end of the foot board can be struck against the ground for moving the person forward.

Mr. Walter P. Prall, of Colusa, Cal., has patented an improvement in sulky hay rakes. To the upper side of the axle of the rake a rod is attached to which the upper ends of spring rake teeth are secured, and from this bar they pass up to and are coiled around a bar placed above and parallel with it. To the middle of the upper bar is connected a lever that is pivoted to the thills, and its upper end can be reached by the driver to raise the rake teeth and discharge the hay. A lever is also connected to the upper bar that can be reached by the foot of the driver. The hand lever and the foot lever move in opposite directions when raising the rake so that the driver can use both to the best advantage.

A velocipede sleigh has been patented by Mr. James B. Bray, of Waverly, N. Y. The drive wheel has a spiked periphery, and is contained in a forked frame swiveled in a vertical bearing in the back bone or main frame, and has handles at its top. Runners are rigidly attached to the main frame at its rear end, and the front runners are connected to its front end by a king bolt. Upon each side of the drive wheel are double crank pedals, which at their outer ends are connected with the front runners by rods, and when the main wheel is turned on its axis the front runners are simultaneously turned.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Magic Lanterns, new model; best made, small and cheap. Wm. T. Gregg, 77 Fulton street, New York.

Blind Wirers and Borers. B.C Davis, Binghamton, N.Y.

See New American File Co.'s Advertisement, p. 46.

Combination Roll and Rubber Co., 68 Warren street, N. Y. Wringer Rolls and Moulded Goods Specialties.

For Sale.—New High Speed Engine, 10x10; will indicate 50 horse power; price complete, $250. S. M. York, Cleveland, O.

Steam Yacht, 41½ ft. by 17. Geo. F Shedd, Waltham, Mass.

Model making, and large or small Experimental Machinery. Jerome Redding & Co., 30 Hanover st., Boston, Mass.

American Fruit Drier. Free Pamphlet. See ad., p. 45.

72″ Independent 3 Jaw Chucks, $42; 48″, $36; 24″, $30. *Warranted* best in the world, and sent on trial. American Twist Drill Co., Meredith, N. H.

Ball's Variable Cut-off Engine. See adv., page 46.

Fire Brick, Tile, and Clay Retorts, all shapes. Borgner & O'Brien, M'f'rs, 23d St., above Race, Phila., Pa.

Drop Forgings of Iron or Steel. See adv., page 46.

For best Portable Forges and Blacksmiths' Hand Blowers, address Buffalo Forge Co., Buffalo, N. Y.

Paragon School Desk Extension Slides. See adv. p. 45.

Brass & Copper in sheets, wire & blanks. See ad. p. 45.

The Chester Steel Castings Co., office 407 Library St., Philadelphia, Pa., can prove by 15,000 Crank Shafts, and 10,000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Diamond Drills, J. Dickinson, 64 Nassau St., N. Y.

Eagle Anvils, 10 cents per pound. Fully warranted.

Tight and Slack Barrel machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus. adv. p. 46.

Draughtsman's Sensitive Paper. T. H. McCollin, Phila., Pa.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 44.

Cutters for Teeth of Gear Wheels formed entirely by machinery. The Pratt & Whitney Co. Hartford, Conn.

Steam Pumps. See adv. Smith, Vaile & Co., p. 46.

Woodwork'g Mach'y. Rollstone Mach. Co. Adv., p. 28.

The Berryman Feed Water Heater and Purifier and Feed Pump. I. B. Davis' Patent. See illus. adv., p. 29.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 28.

Bostwick's Giant Riding Saw Machine, adv., page 28.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 29.

4 to 40 H. P. Steam Engines. See adv. p. 28.

Pure Water furnished Cities, Paper Mills, Laundries, Steam Boilers, etc., by the Multifold System of the Newark Filtering Co., 177 Commerce St., Newark, N. J.

Red Jacket Adjustable Force Pump. See adv., p. 13.

Cope & Maxwell M'f'g Co.'s Pump adv., page 13.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 14.

Supplee Steam Engine. See adv. p. 13.

Malleable and *Fine* Gray Iron Castings to order, by Capital City Malleable Iron Co., Albany, N. Y.

Drop Forgings. Billings & Spencer Co. See adv., p. 405.

Common Sense Dry Kiln. Adapted to drying of all material where kiln, etc., drying houses are used. See p. 405.

"Abbe" Bolt Forging Machines and "Palmer" Power Hammers a specialty. Forsaith & Co., Manchester, N.H.

List 28, describing 3,600 new and second-hand Machines, now ready for distribution. Send stamp for same. S.C. Forsaith & Co., Manchester, N.H., and N.Y. city.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, polishing compositions, etc. Complete outfit for plating, etc. Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Latest Improved Diamond Drills. Send for circular to M. C. Bullock Mfg. Co., 80 to 88 Market St., Chicago, Ill.

First Class Engine Lathes, 20 inch swing, 8 foot bed, now ready. F. C. & A. E. Rowland, New Haven, Conn.

Ice Making Machines and Machines for Cooling Breweries, etc. Pictet Artificial Ice Co. (Limited), 142 Greenwich Street. P. O. Box 3083, New York city.

Jas. F. Hotchkiss, 84 John St., N. Y.: Send me your *free* book entitled "How to Keep Boilers Clean," containing useful information for steam users & engineers. (Forward above by postal or letter; mention this paper.)

Steel Stamps and Pattern Letters. The best made. J. F. W. Dorman, 21 German St., Baltimore. Catalogue free.

Machinery for Light Manufacturing, on hand and built to order. E. E. Garvin & Co., 139 Center St., N. Y.

For Power & Economy, Alcott's Turbine, Mt. Holly, N. J.

Presses & Dies (fruit cans) Ayar Mach. Wks., Salem, N.J.

Wood-Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Presses, Dies, Tools for working Sheet Metals, etc. Fruit and other Can Tools. E. W. Bliss, Brooklyn, N. Y.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

NEW BOOKS AND PUBLICATIONS.

SYNOPSIS OF THE FRESH WATER RHIZOPODS. Compiled by Romeyn Hitchcock. Published by the author, 53 Maiden Lane.

A condensed account of the genera and species of American fresh water rhizopods, founded on the large work of Professor Leidy and intended as a sort of introduction to it. In view of the comparatively little that is known of the life histories of this class of organisms, Mr. Hitchcock sees in their study a broad field for original investigation, and hopes by means of his convenient handbook to awaken a livelier interest among microscopists in this interesting pursuit.

THE PETTIBONE NAME, by Margaret Sidney; AFTER THE FRESHET, by E. A. Rand; ROCKY FORK, by Mary Hartwell Catherwood. Boston: D. Lothrop & Co.

Three cleverly told stories of American life, dealing chiefly with young people, and well calculated to interest girls and the gentler sort of readers generally. Without rising to the level of permanent literature they are first-rate of their class, bright, clean, and entertaining.

MEMOIRS OF THE SCIENCE DEPARTMENT. Tokio Daigaku (Tokio University), Tokio, Japan. Quarto, paper.

These memoirs bear witness of commendable activity in the science department of Tokio University. No. 6 (pp. 73, plates xix.) is an elaborate study of the chemistryof saki brewing, by R. W. Atkinson, Professor of Analytical and Applied Chemistry. No. 7 (pp. 81, charts 26) is a report on the meteorology of Tokio, for 1880, by T. C. Mendenhall, Professor of Experimental Physics, with a chapter on fires in Tokio, by Professor K. Yamagawa. No. 8 (pp. 27) embodies a reinvestigation of the wave lengths of some of the principal Fraunhofer lines of the solar spectrum, also by Professor Mendenhall.

THE LORD'S PURSE BEARER. By Hesba Stretton. Boston: D. Lothrop & Co.

An English story; life among the vicious poor of London. Why such books should be reproduced and read here is unaccountable.

THE MOTHER'S RECORD. Boston: D. Lothrop & Co. $1.

A record book with spaces for entering year by year the more important or interesting facts of a child's history. The items of entry are largely of sentimental or domestic interest, yet others of a strictly scientific nature are provided, with blank space for such additional entries as the parent may wish to make. Properly kept, a record of a child's physical and intellectual nurture, growth, and development could not fail to be interesting and valuable. The studies of infancy made by Darwin and Taine already prove that. It is doubtful, however, whether many parents will follow their example.

THE GAS AND WATER COMPANIES' DIRECTORY, 1882; GAS WORKS STATISTICS, 1882; WATER WORKS STATISTICS, 1882. Edited by Charles W. Hastings. London: The Scientific Publishing Company.

These useful annuals have now reached respectively their sixth, fourth, and second issue. They all show a creditable advance in the fullness of their statistics and other information of use to all interested in or having dealings with water and gas works and their management.

MODERN HOUSE PAINTING. By E. K. Rossiter and F. A. Wright, Architects. New York: William T. Comstock.

Contains twenty colored lithographic plates exhibiting the use of color in exterior and interior house painting, with letterpress describing the preparation, use, and application of color. The arrangements of color will be found very suggestive, even when they may not be deemed suitable for imitation.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) A. D. A., M.D., asks: What is the difference in value of pure gold and pure platinum? A. Gold is worth about $21 an ounce (troy), platinum $8 an ounce.

(2) C. E. P. asks: Please inform me of a good inexpensive material—which is a non-conductor of sound—to be used between the inner and outer matched board sheeting. A. Dry, coarse sawdust, loosely packed, or coarsely powdered charcoal, is cheap, and will probably give satisfaction if properly employed.

(3) Miss M. C. G. asks: What shall I use to cleanse some old engravings and lithographs, neglected and dirty, but apparently uninjured otherwise? A. To clean engravings, prints, or plain uncolored lithographs: Free the paper from traces of dust, and float it, face downward, for half an hour or more on the surface of a clear solution of six ounces of fresh chloride of lime (calcium hypochlorite) in a pint of soft cold water contained in a shallow porcelain dish. Float on the surface of water containing about three drachms of sulphuric acid to the pint. If not then white enough repeat the operations, and finally rinse thoroughly in a spray of clear cold water, and dry between clean blotting pads under pressure. Colored lithographs cannot be safely cleansed by this or other chemical treatment.

(4) F. A. R. asks: What will prevent moisture gathering on a water pipe that runs through my cellar, overhead? A. Cover the pipe with a non-conductor of heat.

(5) J. B. writes: Reading your correspondence with reference to defective sheets in steam boilers, caused by flat surfaces at the end of sheets after bending. I am a practical boiler maker, and I have always used the following plan when bending sheets, which has saved me the trouble of having to draw in the ends with the hammer after bending. To place a thin strip of sheet iron betwixt the end of sheet and the lower roll the whole width of plate when passing through the rolls. [This is a very good way of overcoming the difficulty.—EDS.]

(6) A. W. R. writes: Please inform me whether it is necessary that a Leclanche battery must be hermetically closed or sealed; or is it just done to avoid the evaporation of water? You would oblige me very much by answering in the Notes and Queries column of the SCIENTIFIC AMERICAN, of which I am subscriber. A. The cups are sealed mainly with a view to prevent evaporation of the solution and the disagreeable creeping of the salt dissolved, which in some cases materially affects the insulation of the cells. This sealing is not absolutely necessary, however.

(7) D. A. O.—Our answer to this correspondent, about injectors, published July 8, needs to be rendered more full. The Korting Double Tube Injector will elevate water from wells 60 feet deep, by placing the injector within 20 feet of the water and elevating 40 feet to boiler, also feeding the boiler. One handle operates the injector, and by attaching a wooden lever, any one can start and stop injector from top of well very readily.

(8) H. B. J. asks: 1. Is a large building covered with a tin roof lightning proof? A. No. But a metallic roof has the advantage that it may diffuse the electricity and assist it in taking to the ground by several different routes, with less destructive effect than if it went on one route. 2. Is there a case known of a building being seriously damaged by lightning when so covered? A. Yes; you will find examples of buildings that were damaged that had metallic roofs, but no rods, in back volumes of SCIENTIFIC AMERICAN.

(9) H. H. F. asks: Will you please inform me in the Notes and Queries in the SCIENTIFIC AMERICAN how what is called "burnt finish" is produced on tool handles, etc.? It produces a clouded surface of various shades of brown which is very fine after polishing. A. This may be done by running a red hot iron over the surface quickly; producing a variety of effect by touching or not touching the surface or by varying the shapes of the irons. Similar effects may also be produced by using a blow pipe with a sharp hot blast. It should be attached to the lamp and also to a blower with a small rubber hose, so that it can be quickly moved over the work. Rings or bands are made as of old by friction against hard wood while running in the lathe. Polish with a mixture of alcoholic shellac varnish, two parts, boiled linseed oil one part, shaken well together, and applied with a cloth while the work is in motion.

(10) M. L. S. writes: 1. If the heat of the sun is seventy degrees on each square foot of surface, what will be the heat if the rays, naturally falling on three square feet of surface, be reflected by mirrors on to one square foot of surface? A. Other things being equal, the heat will be multiplied by the number of reflectors. The Adams solar boilers (Madras) are operated by batteries of plane reflectors set so as to converge the solar rays upon the boiler. 2. Is there anything for removing ink (writing ink) stains from hands? A. Yes; different inks require different treatment.

(11) A. L. R. writes: You say in SUPPLEMENT, No. 157, in describing De la Rue's chloride of silver cell (page 2490): "The pure silver deposit can be readily turned into chloride of silver again by means of a small quantity of chlorine." I do not know this process. I have been told that the usual method is that of precipitating silver, by a quantity of salt dropped into a solution of nitrate of silver, and fusing this precipitate in a crucible with charcoal. Will this produce chloride of silver, or must it be done in a different way? A. The process referred to is intended to convert fine metallic silver into silver chloride. Silver chloride may be produced from dissolved silver nitrate more economically by the addition of muriatic (hydrochloric) acid to the liquid chloride of silver precipitates. This chloride may be purified by washing on a filter (with distilled or rain water) and drying in a porcelain dish over a sand bath in the dark.

(12) W. H. E. asks: Is there anything that will take off tattooing? A. The tattooed work can only be removed by a surgical operation, but the color may be cloaked by carefully "pricking in" fresh cream over the design.

(13) A. W. asks: Will you please tell me why hair falls, and what are the principal substances that make it fall? A. See "Hygiene of the Hair," by Professor Erasmus Wilson, in SUPPLEMENT, No. 102.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

June 27, 1882,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired and remit to Munn & Co., 261 Broadway, corner of Warren Street, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

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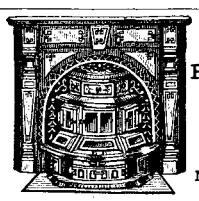

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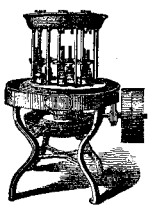

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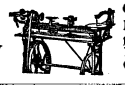

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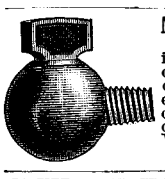

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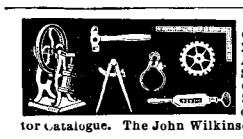

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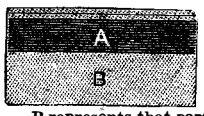

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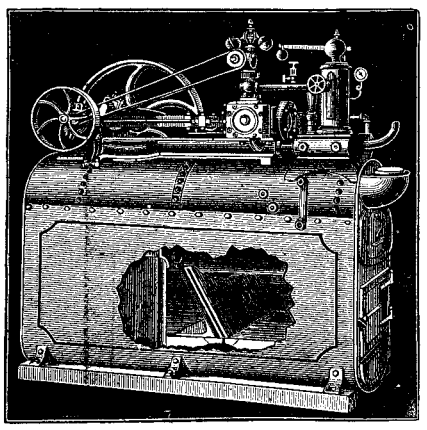

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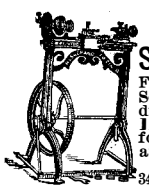

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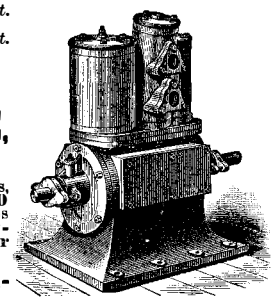

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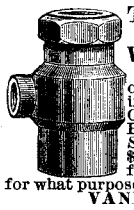

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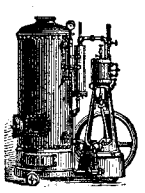

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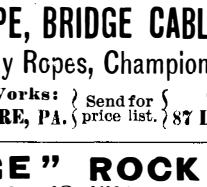

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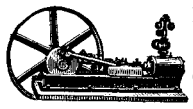

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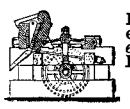

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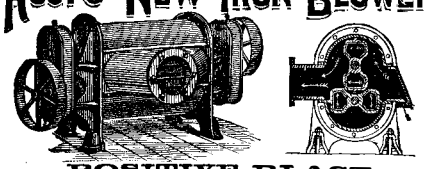

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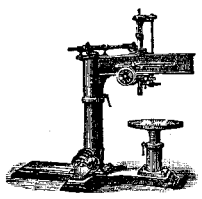

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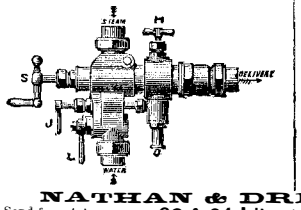

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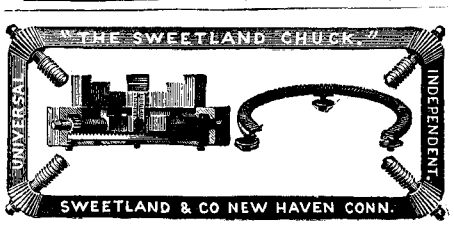

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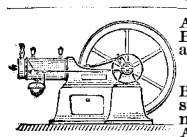

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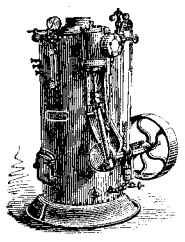

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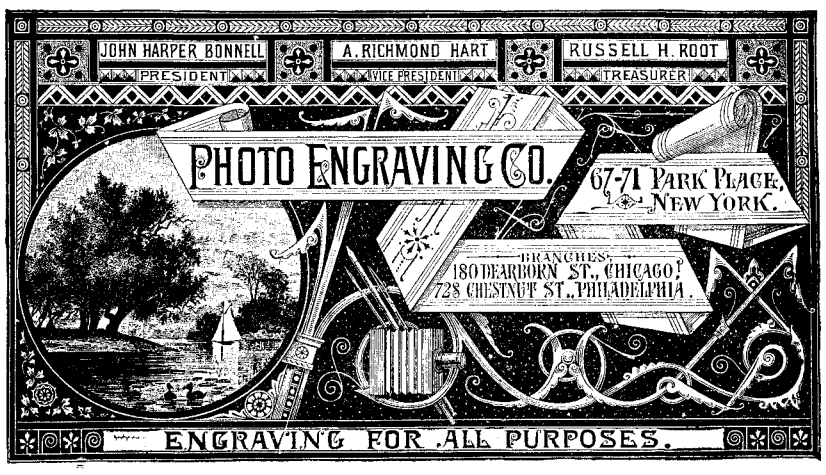

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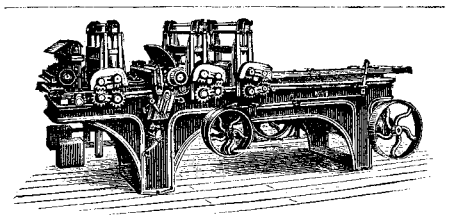

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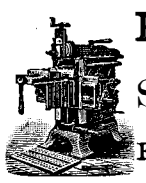

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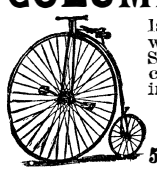

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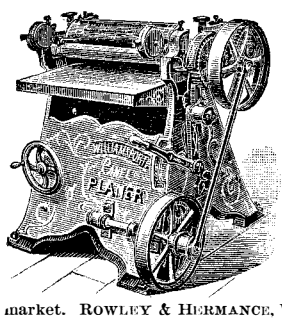

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